British Society for the Study of Orthodontics 1938

PROFESSOR
WALTHER

THE ROYAL DENTAL HOSPITAL OF LONDON.
32, LEICESTER SQUARE, W.C.2.

TRANSACTIONS
OF THE
BRITISH SOCIETY FOR THE STUDY OF ORTHODONTICS
1938

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TRANSACTIONS

OF THE

British Society for the Study of Orthodontics

1938

London :
PUBLISHED FOR THE SOCIETY BY
THE DENTAL MANUFACTURING COMPANY LTD.
BROCK HOUSE, 97, GREAT PORTLAND STREET, W.1

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Fig. XII (page 17)

This is the painting of Adam in the Prado at Madrid. It is considered by connoisseurs to be a perfect figure.

The British Society for the Study of Orthodontics

HUMAN PROPORTIONS*

By L. Lindsay, L.D.S.Edin.

MR. NORTHCROFT, to whom all members of the profession are indebted, has told me about the origins of this Society, how, like many kindred societies, it began in desultory conversations among friends, discussing the problems underlying the irregularities of the teeth, and, as they discussed, their horizon naturally widened out, and the truth of the old proverb that " in the multitude of counsellors there is wisdom " was borne in upon them, and they decided to found a society. In consultation with a scholar, Mr. Northcroft proposed as the title of the society, " The Society for the Study of Odonto-Prosopic Orthopædics." It was comprehensive, it was expressive in its definition, yet it did not find favour in the eyes of his colleagues. They felt that it was too recondite, that it would not be readily understood. As at that time, some advance had been made in America in this department of the practice of dentistry, and the spurious word " orthodontia " had been coined to express it, that title was chosen in preference to that suggested by Mr. Northcroft. Fortunately for the claim of dentistry in this country to be regarded as one of the learned professions, another scholar came to the rescue, and through the good offices of Mr. Schelling, the Council was persuaded to depose the mongrel " orthodontia " in favour of a word of purer descent, " orthodontics," which has reigned ever since. In the latest edition of his book, McCoy has changed " orthodontia " to " orthodontics," and explains in his preface, the reason for so doing ; it is not the reason that I have given, but, as he says, in order to bring the word into line with " obstetrics," " orthopædics " and " pediatrics." All that time there was lying ready to be chosen a title more comprehensive than that suggested by Mr. Northcroft, and, because it could be translated into simple English, it would have been understood by everybody. Nevertheless, as it was not chosen, it must now be relegated to that saddest of all categories, the might-have-beens.

* Presidential Address delivered to the Society on February 1st, 1938.

In the year 1528, there was published a work in four books entitled, "The Theory of Human Proportions," its author being Albrecht Dürer. Dürer was not only a painter and draughtsman, but, like his great contemporary, Leonardo da Vinci, he was an observer and thinker, who, by the study of many branches of knowledge, as he himself expressed it, "taking one subject after another for particular study, striving heartily with it, investigating it, reducing it to theory and finally making himself master of it," saw more than professionals who had devoted their whole lives to the study of one subject.

Albrecht Dürer was born at a time when "craftsmen had sacrificed to a perverted dexterity, a true sense of design." He was first of all apprenticed to his father, a noted goldsmith, and later to Wohlgemut, the wood engraver, and he was filled with a divine discontent. Naturally the rule of thumb method did not appeal to his orderly mind. He felt there must be some law, some principle, to guide his hand, and when his apprenticeship terminated, he started on his travels to examine the works of the great masters, to see whether there was one who could teach him what he wanted to know. At last he saw a figure of a man and woman, which seemed to suggest that the artist had a canon of proportions. This artist was Jacopo de Barbari; he lived in Venice, and Dürer set out to sit at his feet in order to learn from him.

Fig. I.

I do not know the works of Barbari, except this one, a line engraving in the British Museum. It filled me with so much delight that I had a slide made of it, in the hope that you might share in my pleasure. I think you will see in it what it was in the artist that attracted Dürer's attention, the perspective, the grouping and proportions of the figures and the composition of the whole. Unfortunately Barbari, like many before and since his time, kept his secrets to himself. Dürer left him no wiser than when he arrived, and he expressed his disappointment by saying, "I had

rather have been told his opinion than to behold a new kingdom." He made a great resolve that, if he found this law of proportion, he would impart it to his colleagues, write about it and hand it down to posterity. In this he resembled the great pioneer in dentistry, Pierre Fauchard, whose effigy has been chosen for the badge of this Society.

Dürer went through the towns of Italy, studying all the great works of antiquity and the noble cathedrals and churches then in course of erection. He realised that the foundation of proportions was a knowledge of geometry. It must be remembered that his father was a poor man, who had seventeen children ; Albrecht was his favourite and the most intelligent of them. He had been sent to school, but removed at the age of nine or ten, to be apprenticed to his father, so that his education was very scanty, and all the wonderful knowledge that he displays in his works was obtained by that particular study and hearty striving with each subject. He drew everything that he saw—landscapes, buildings, exquisite studies of plants and flowers, animals and birds, and, finally, man. In order to get as many sketches of the human figure in the nude as possible, he frequented the baths. As we read through his letters, his sketch books, his diary and the four volumes of his " Theory of Human Proportions," we can trace his thoughts. He says, " Our art is not only for painters and sculptors, but for all men who desire to understand by measurement what are the normal proportions of the human body."

At last Dürer discovered a plan of measurement by sketching the human body, as if outstretched upon a St. Andrew's cross. Taking the navel as the centre, he drew a circle, the circumference of which touched the extremities of the outstretched limbs. Then he dropped a perpendicular through the centre and started to measure off the different parts of the body and to get their proportions to the whole (Fig. II).

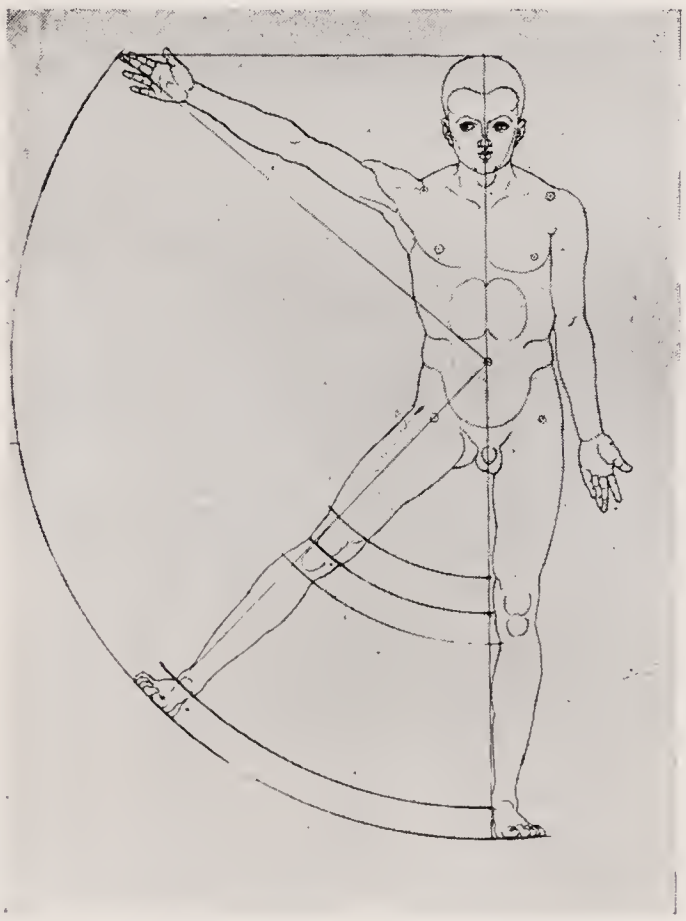

Fig. II

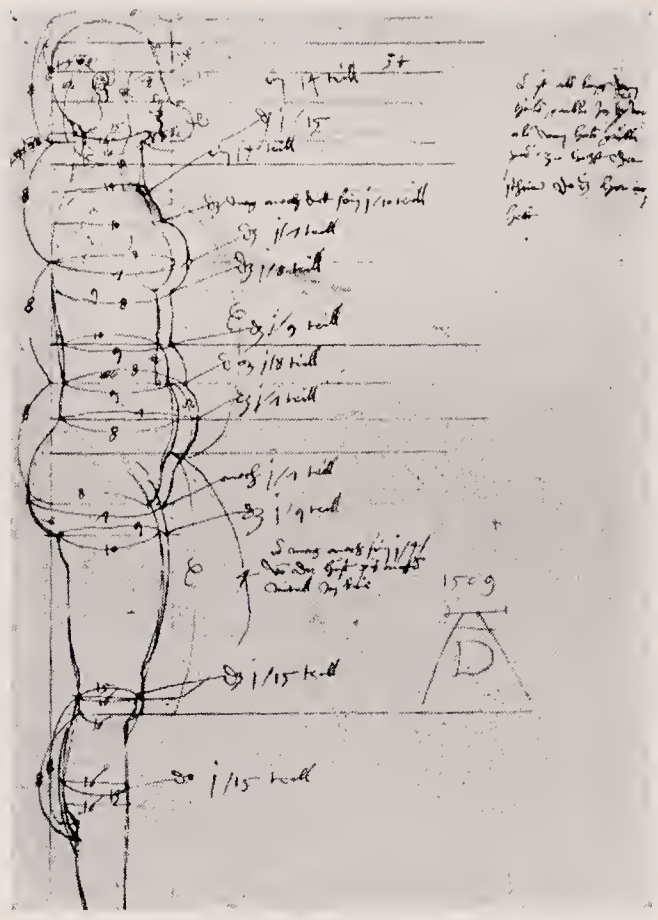

Fig. III.

Fig. III shows how Dürer started to find the proportion of all the different parts of the body.

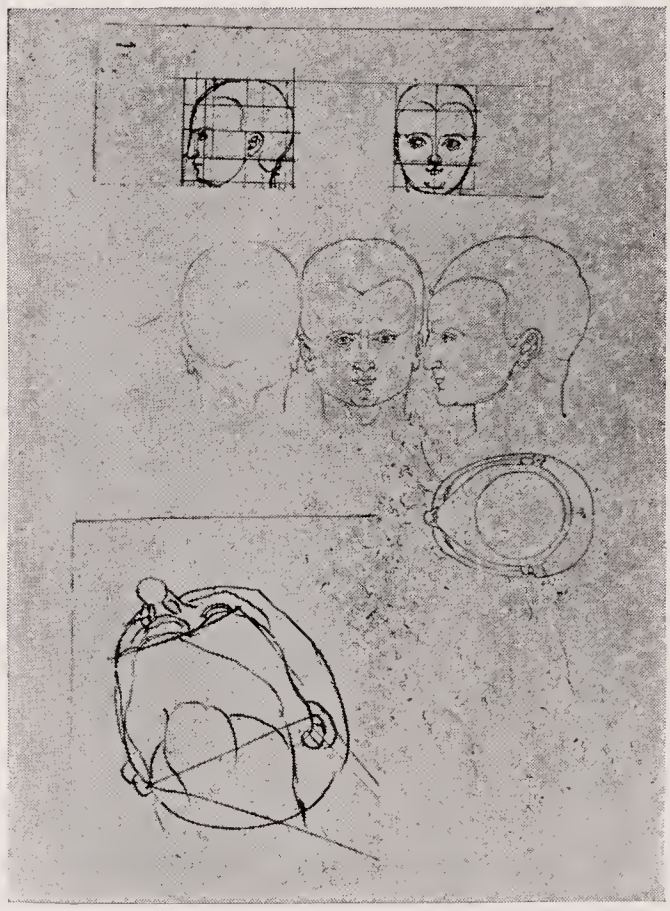

Fig. IV.

Dürer does not choose Greek words to express his points of measurement ; instead of speaking of the mental point to the trichion, he says, " from the chin to where the hair starts on the forehead is one-tenth part of a man." He found that the face could be divided into three equal parts, from where the hair starts to the root of the nose, from there to beneath the nose, and from beneath the nose to the chin (Fig. IV).

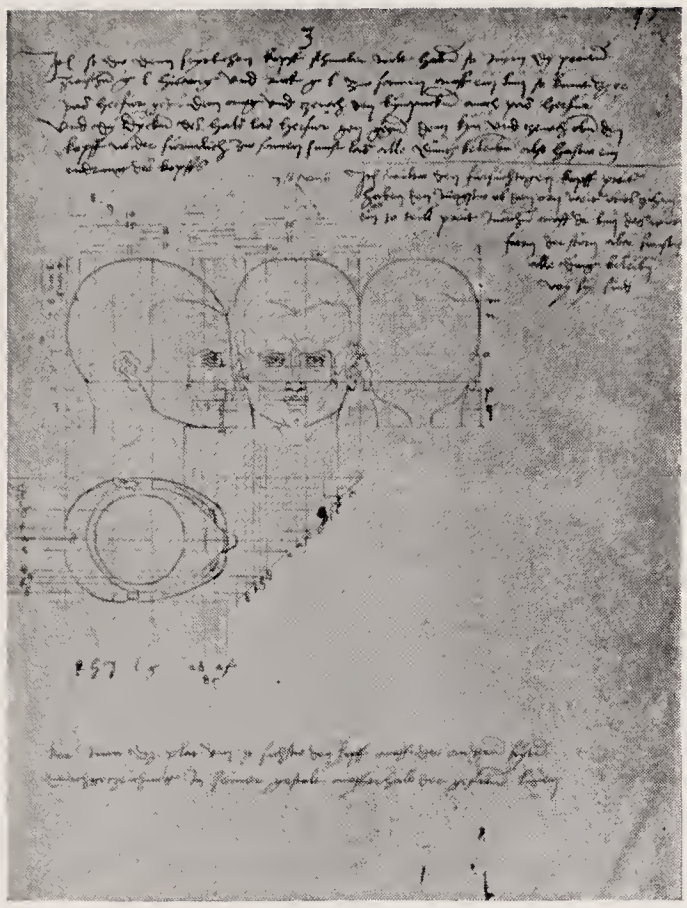

Fig. V.

Fig. V. is another study of heads, and with all the different points of measurement which Dürer used.

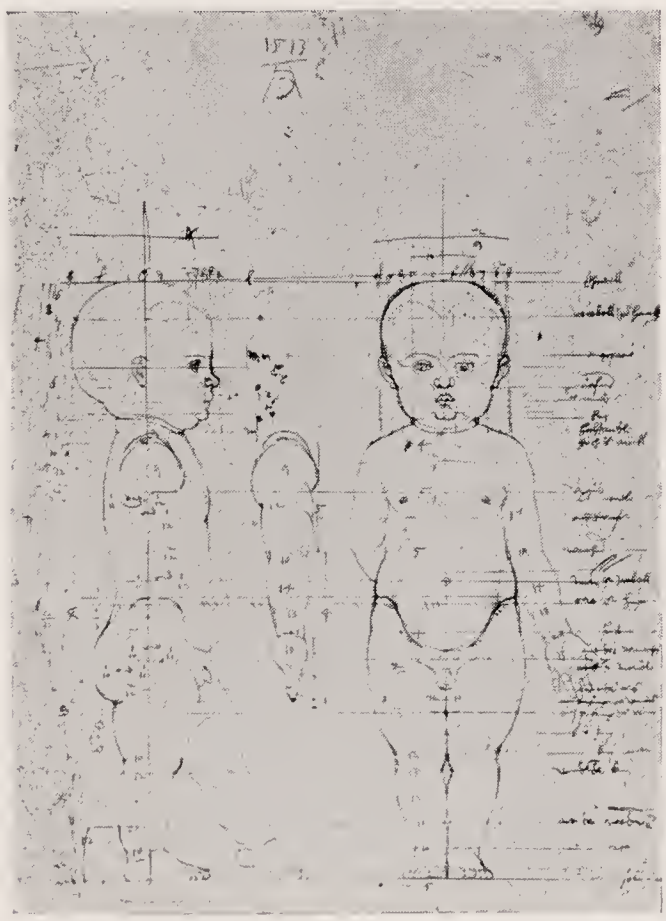

Fig. VI.

Dürer began with the child, using the same measurement, dropping the perpendicular which accompanied most of the figures (Fig. VI).

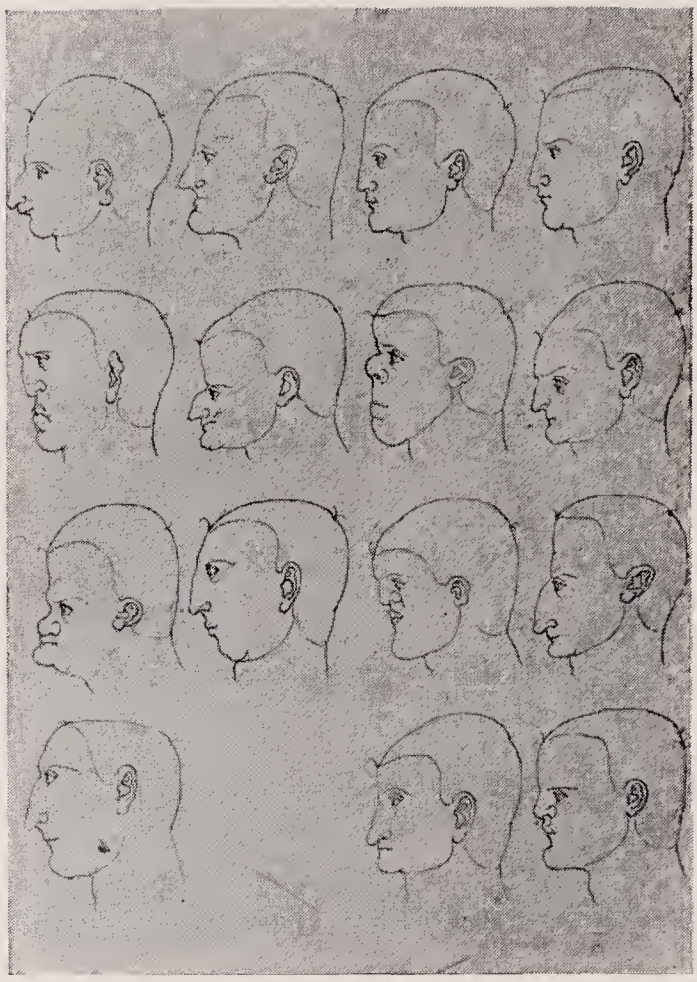

Fig. VII.

Dürer found heads of all shapes, and he became more and more bewildered about the question of proportions. He found faces that were " bent out " and faces that were " bent in " and he came to the conclusion that the same material went to the make-up of all heads ; sometimes it was elongated and sometimes it was compressed.

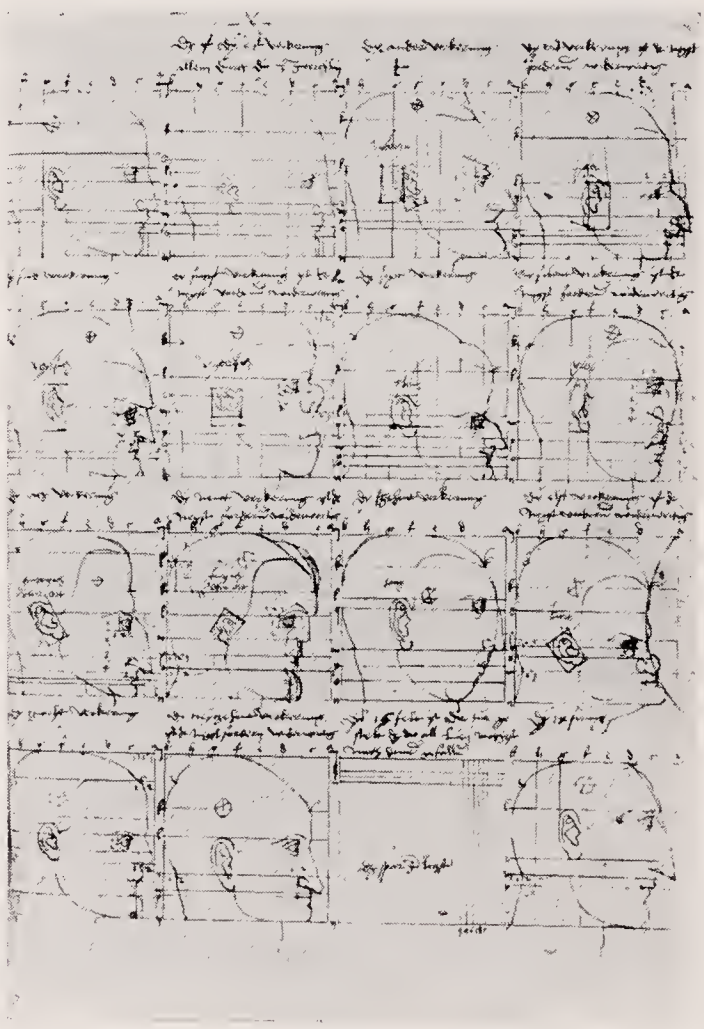

Fig. VIII.

From the perpendicular of a tenth of a man, Dürer drew a horizontal line; at right angles from this, he formed a square. When he started to fit the heads into these squares, he found it was much more difficult than he had imagined. He says, "In the human body are the most secret mysteries of proportion," and, "Seeing that the measure of a human figure is specially hard to comprehend, amongst other reasons, because the human figure is composed neither by rule nor compass, but is contained within irregular curved outlines, it is specially hard to write and treat of it."

Fig. IX.

Dürer says, "We do not use measurement to describe or paint them, but to reason about what they contain or encompass." He studied temperaments and physiognomy and found that certain traits of character went with certain features of the face. In his study of the apostles (Fig. IX), he has given St. Mark superior protrusion. It is an example of his keen observation of details that St. Mark has a thick under-lip. Dürer may have noticed that this condition often goes with a bright, intelligent and impulsive nature, often passionate, irresponsible and unreliable, and therefore he gave St. Mark this feature in order to express his character. It is interesting to find that Sir Norman Bennett has recently contributed a paper to the *British Dental Journal* in which he stated that children with postnormal occlusion are often very bright and intelligent.

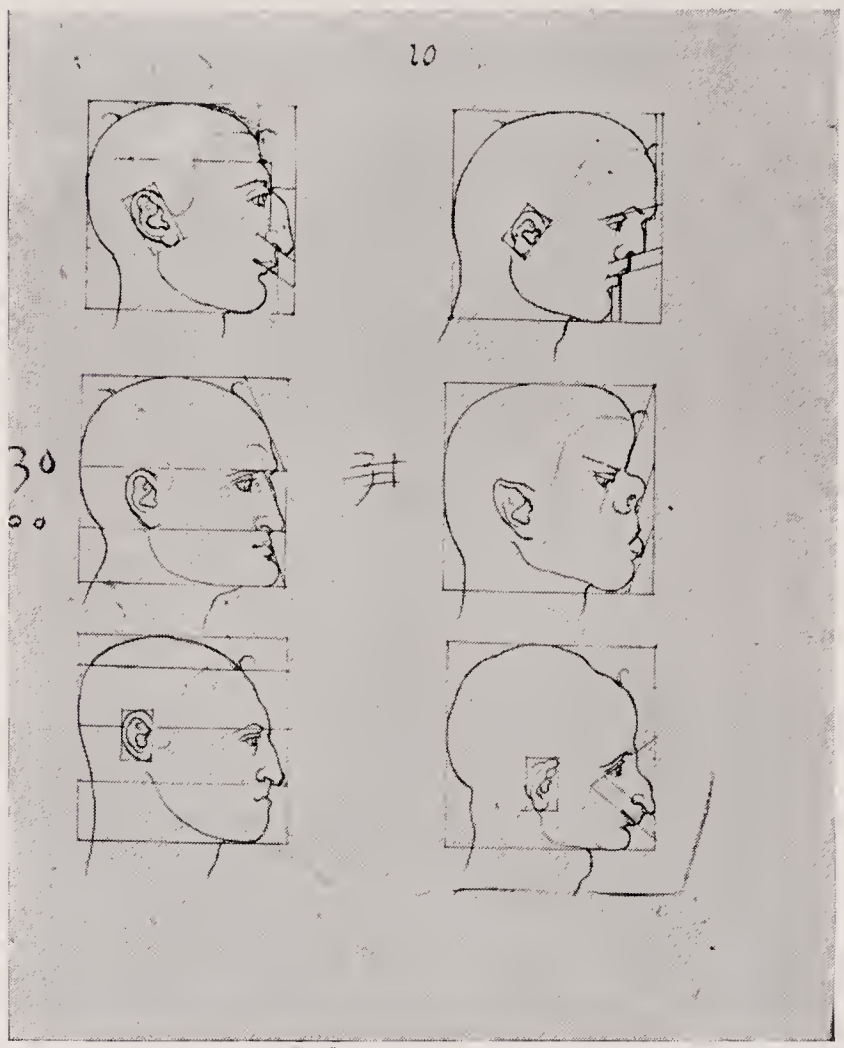

Fig. X.

In Fig. X, it would seem that Dürer tried some new points of measurement. If the face on the bottom line on the right be examined it will be seen that he tried to measure the middle part of the face by means of a triangle, and if the apex had been carried a little further back to the ear, he might have forestalled the Committee of Investigation into Postnormal Occlusion.

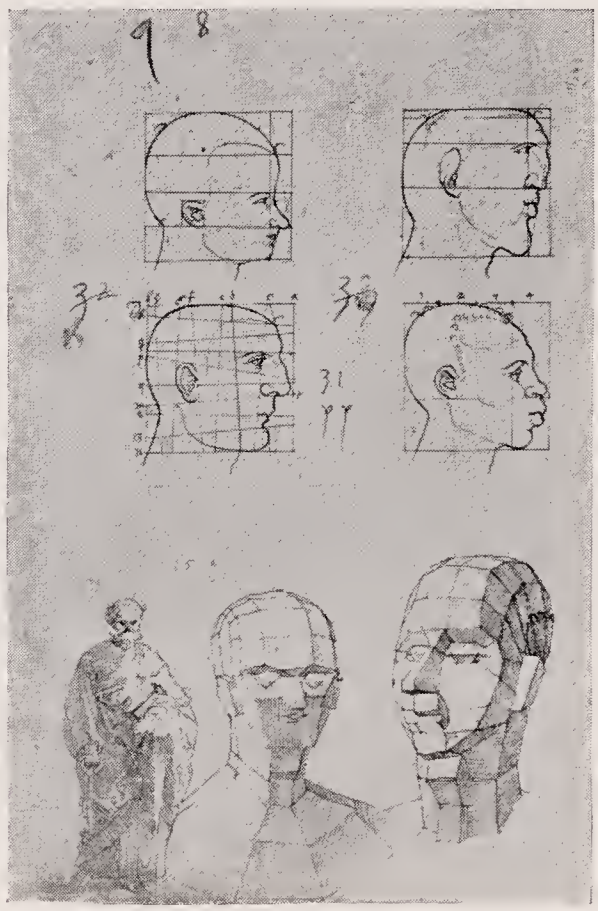

Fig. XI.

Dürer was troubled with the third dimension, depth, and in order to express it, he drew cubes, so that the cubist is not so modern as he would like us to think ! Then comes a cry of despair, " It seemeth to me impossible that a man may say that he can point out what are the true proportions of the human figure. The lie is in our perception, and darkness abideth so heavily about us that even our gropings fail." Dürer was all the time looking for the perfect man, whom he conceived to be Adam (Fig. XII, Frontispiece). He found that not even the most beautiful man had all his parts in proportion, but that it took two or three hundred beautiful men before he could find one or two good things that might be used.

The saying that two or three hundred beautiful men were required before one could find two or three good things, threw a great light on my mind ; it made me realise that the Apollos and Venuses which Angle held up for emulation never existed—they are composite portraits, and that the Greeks were no more beautiful than we are to-day, in spite of their physical culture. Winkelmann says that beauty cannot exist without proportion, but there may be proportion without beauty, and I think Mr. Rushton gave a good example of this some years ago, when he showed a case which had been regulated according to Angle's teaching by keeping all the teeth and bringing them into good alignment and good occlusion, but the face looked as though it were all teeth. Lavater puts it very well when he says that " he knows little who thinks Nature picks out the features of a man as a compositor picks out letters to form a word." Dürer sums it all up by saying, " The Creator made man once for all as he must be, and I hold that the perfection of form and beauty is to be found in the sum of all men." That was a flash of genius, an inspired theorem which was demonstrated four hundred years later at University College. Some of you may remember a scholarly and valuable paper given to this Society by Miss Tildesley, at the end of 1930, in which she gave some very good advice, i.e. not to exercise selection in making statistical measurements but to take samples. At University College in 1928, samples were taken of undergraduates ; they were tall and short, postnormal and prenormal, with snub noses and aquiline noses, just as they came. Their profiles were plotted and a composite silhouette was made of the whole.

Fig. XIII.

Fig. XIV.

Reproduced from "Biometrica" XXV, 1928, by kind permission of Prof. Karl Pearson.

Fig. XIII is the result of the composite silhouette of the male undergraduates. It is quite pleasing, but that of the female students (Fig. XIV) is much more pleasing.

As I looked at that it seemed to me to suggest Milton's line, "For softness she and sweet attractive grace," and, I would add, instinct with intellect and vitality. I would suggest that this would be a very fruitful field of research for any of you to engage in by taking samples of this kind from among your school children and plotting their profiles and getting silhouettes made.

This Society has been in existence for some thirty years, and all that time it has been handicapped in its attempts to provide facilities for the study of orthodontics. Individual efforts have been made, as when Mr. Lewin Payne gave to this Society a handsome cabinet to house the library and museum, and Mr. Chapman followed suit with another very handsome cabinet for the museum. For a long time, those cabinets, like the Ark of the Covenant, wandered through the wilderness; they found a temporary asylum in a threshing floor, and at last they have been brought to rest, not with song and dance it is true, yet not without a certain hazard, in an upper chamber at the headquarters of the British Dental Association at 13, Hill Street. Your council is furnishing and equipping that room comfortably and suitably, so that the members can go there and read the literature and study the specimens and models in the museum.

In Miss Smyth we have an excellent Honorary Librarian, and I should like to pay this public tribute to her. She has been the

programme secretary for the last two or three years, and she has only given up that in order to concentrate upon the library. She told me that she had made a special effort with regard to the programme this year for my sake, and I should like to thank her publicly for that. In Mr. Russell Marsh we have an excellent Honorary Curator. These two officers are not only willing, but able to give advice and help to members who wish to study. We must bear in mind the saying of Nietzsche, that it is those who enjoy who think that the fruit is the most important part of the tree, but the tree knows that it is the seed that is the most important part, and that is the difference between those who enjoy and those who create. It is important that we should have some good original work as a result of the facilities provided. In his first presidential address to this Society, Mr. Northcroft made an appeal to the members to collect serial models of individuals from early years to adult life, but in the past thirty years I do not think that more than four or five members have responded to that appeal. Mr. Northcroft is a man who practises what he preaches, and he has been very kind in allowing me to show these lantern slides of his son. Not only did he collect the serial models, but he also collected face masks, which he superimposed to show the growth in length and breadth, and in length and depth (Figs. XV, XVI).

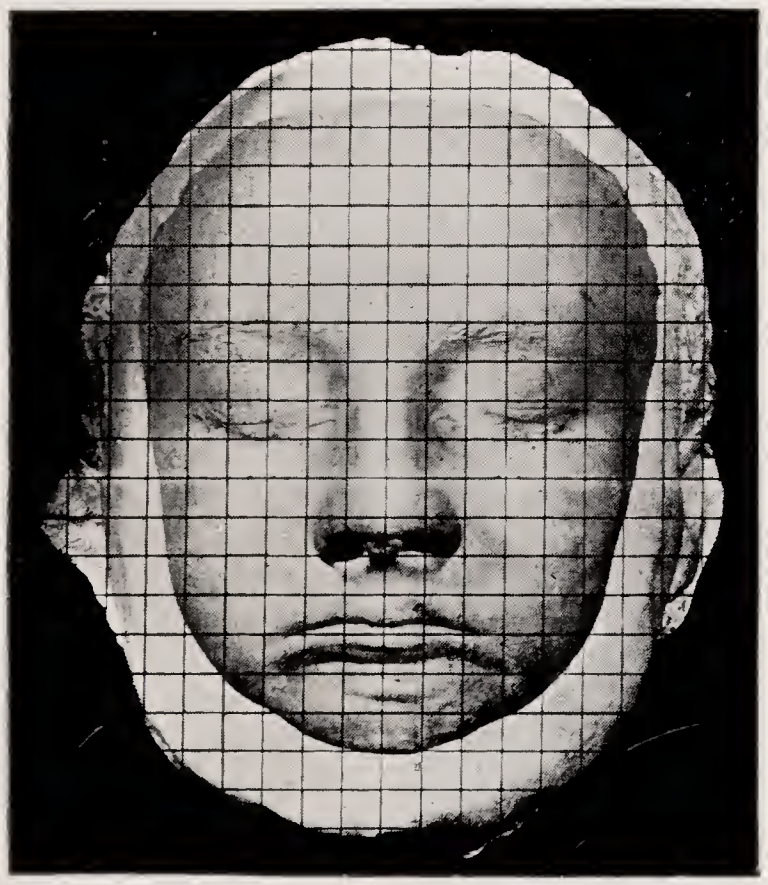

Fig. XV.

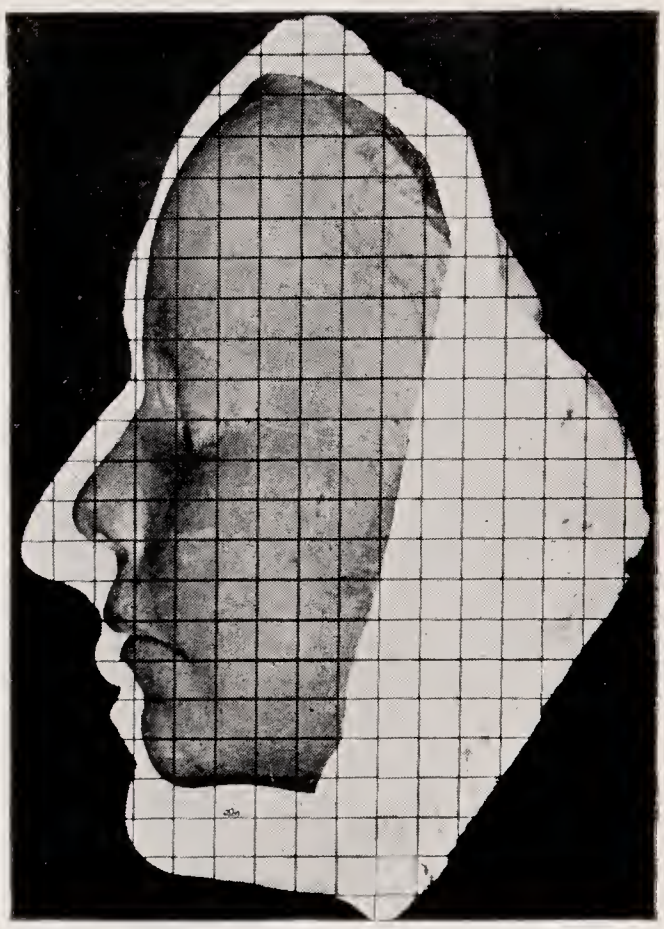

Fig. XVI.

There must be many young parents among the members here, and I would repeat that appeal of Mr. Northcroft's that they would collect similar material, so that in the next thirty years there may be an unrivalled collection in our museum which will make the Society the cynosure of all the orthodontists in the world. As, in

having done this work, Mr. Northcroft is unique among orthodontists, so I think that Dürer was unique among painters, in that he painted his own portrait from childhood to manhood.

Fig. XVII.

Fig. XVII is Dürer's portrait as a child. Written above it, is: "painted from my reflection in the looking-glass when I was a child—1484." He was then 13 years of age. No one looking at that picture would hesitate to say that that child would one day be a master painter of the world.

Fig. XVIII.

Fig. XVIII is a portrait of Dürer as a youth, between 16 and 17 years of age. You will notice his hands, which, after heads and faces, were his chief study.

There is another portrait of Dürer, when in the pride of his youth, he was starting out on his journeys. It is in the Prado at Madrid, full of colour, yellows and greens and blacks, and you notice again his hands and his wonderful curls, which attracted the attention of the aged artist, Bellini. Bellini asked Dürer to show him the special brush he used for painting his curls, and Dürer, taking up an ordinary brush, showed him that it was the special hand that used the brush. He had not then got into all the mists and darknesses into which he was plunged later on. Fig. XIX is a sketch of his face during that period.

Fig. XIX.

It is a very strange face. His curls have gone and he seems to be peering through the darkness. However, he climbed up the hill of difficulty beyond the mists.

Fig. XX.

In Fig. XX he has reached the prime of life. His curls have returned, and now he looks out with majestic serenity. He has not reached the top of the mountain, but he has found the way there and has pointed it out to others. As I look at that face, it seems to me that he is looking into the future, expressing the thoughts and aims of the founders of this Society, when he says: "If we wish to sharpen our reason by learning and to practise ourselves therein, having once found the right path, we may seek, learn, comprehend and finally reach and attain unto something true."

Mr. G. Northcroft, in moving a very hearty vote of thanks to the President for her most able address, said he had never enjoyed a Presidential Address more and had listened enthralled to Mrs. Lindsay's eloquence, wit and learning. He had appreciated every word that Mrs. Lindsay had said, and he was sure all the members would be very proud to belong to the Society during her year of office as President.

The motion was seconded and was carried with acclamation.

WHEN ORTHODONTIC TREATMENT TO ENLARGE ARCHES IS INDICATED*

And Other Details of Treatment in Different Classes.

By Harold Chapman, L.D.S.Eng.

The following notes are explanatory of the text:
Expansion, arch widened, arch expanded, all mean "increase of arch breadth," and do not include increase of length, e.g. by labial movement of incisors.

The Angle classification is used, interpreted according to our present knowledge of normal occlusion, which is essential for accurate diagnosis.

Arch relationship refers to relationship in the antero-posterior direction only, the upper arch being regarded as fixed.

An unknown factor is the post-natal influences (if any) which may affect growth of the jaws.

Orthodontic treatment may involve at least three different types of bone change :—

(i) Enlargement of the masticatory face, i.e. increase in the amount of bone if the arches are too small and all the teeth are kept. I suspect this is not possible : prognosis unfavourable.

(ii) Change in the position and correlated shape of the mandible in the antero-posterior direction and correlated change in the arch breadth of the maxilla. Prognosis favourable (orthopædic change).

(iii) Change in position of individual teeth, e.g. rotation, alignment and inclination : these three movements probably involve different bone changes.

All three types are entirely different problems, and in treatment this must be recognised. They may occur in any combination. Types (i) and (ii) are of particular importance in this paper.

There are various degrees of *smallness* of arches : in addition to normal they may be described as (i) almost correct, (ii) slightly small, (iii) decidedly small.

Errors of overbite are probably not capable of correction.

* Read before the Society, February, 1938.

It is assumed that the upper and lower teeth are in normal bucco-lingual relations ; when they are not it is specially mentioned.

A normal lower arch, i.e. one naturally normal in size, may be a factor in maintaining a widened upper arch : in such cases the amount of increase of upper arch breadth is small.

The masticatory face is the area below the supra-glabellar depression (often imperfectly marked and so in practice the nasion is used) and in front of the external auditory meatuses (Fig. 1.).

Illustrations which have appeared in the first four papers of the bibliography are not repeated, but the reference is given : thus Fig. 4 of this paper is described as (Fig. 6 in (4)), (4) being the article entitled, " Failures in Orthodontic Practice " in which it appears.

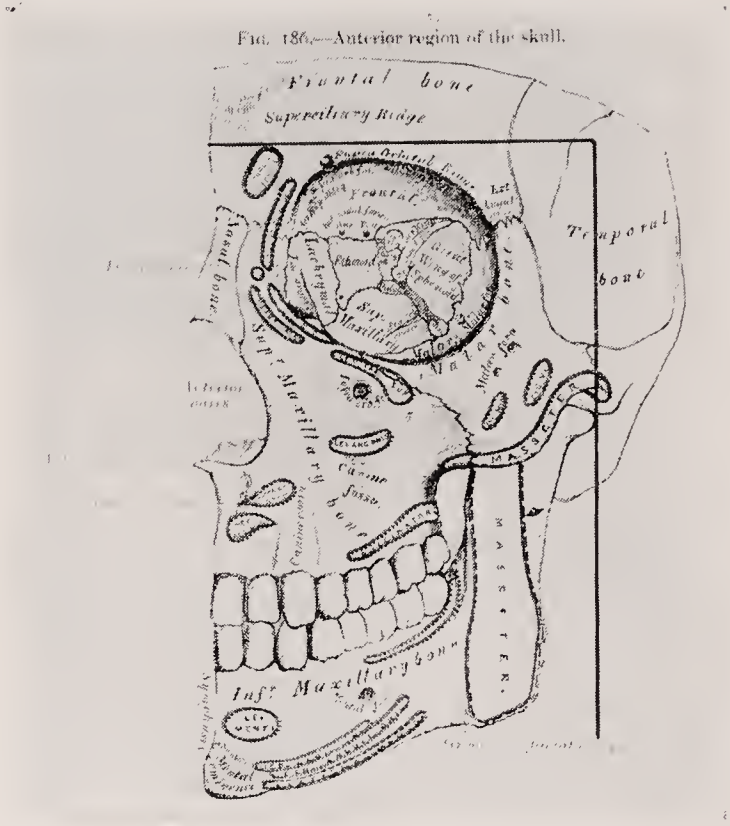

Fig. 186.—Anterior region of the skull.

Figure 1.

Reproduced from the 14th edition of Gray's " Anatomy," by kind permission of Messrs. Longmans Green & Co., Ltd.

The Masticatory Face is the area below and to the left of the two dark lines at right angles to one another.

SOME amount of experience, which perhaps is insufficient, and perhaps it would be difficult for one person to obtain sufficient, leads me to suspect that permanent expansion of the dental arch by appliances beyond what it would widen naturally (except to a very limited extent, certain exceptions are enumerated below) is not possible. The results of clinical observation have led to this paper in order that my colleagues may be on the look-out to verify or disprove my suspicions from their own experience.

I have abandoned the treatment of typical Class I cases by expansion, such as Figs. 5 and 2 (Case 295 Figs. 1 and 2 in (4)).

I hold the view that good arches depend on the development of the masticatory face (which includes the apical base of Lundstrom) and that if it is not large enough by nature it cannot be enlarged by artificial means such as orthodontic appliances.

180B AGE 7–8. 180F AGE 13–10.

180 AGE 29–4.

Figure 5

Bennett, Norman G.: "The Science and Practice of Dental Surgery," Vol. I, 2nd Ed., p. 581, Fig. 581, B and F.

This does not mean that I have abandoned expansion as treatment or part of treatment in all cases.

In certain cases I do increase the arch breadth, more particularly the upper arch breadth: I will endeavour to indicate the types of cases in which I do this, and the principles which guide me.

I increase the lower arch breadth in relatively few cases, and

Supplementary Classification		
ARCH RELATION	SIZE OF MASTICATORY FACE AND DENTAL ARCHES	
	NORMAL	SMALL
NORMAL	*NORMAL OCCLUSION*	Class I
POST-NORMAL	Class II	Class II
PRE-NORMAL	Class III	Class III
	PROGNOSIS	
TREATMENT (If all teeth kept)	Good	Not good

Figure 3

Chapman, Harold: Transactions British Society Study of Orthodontics, 1937, and "Dental Record," Feb. 1938, p. 57.

then usually it is in anticipation of the natural arch breadth increase ; also in border-line cases if I have *in situ* an appliance which will do this. If the lower arch breadth is increased, usually the upper arch breadth must also be increased.

All cases may be divided into two groups according as the masticatory face is : (A) normal in size, or (B) too small (Fig. 3) : or in other words, according as the teeth are normal in size for the masticatory face or too large for the masticatory face.

A. The masticatory face and dental arches are normal in size : i.e. there is no deficiency in the amount of bone comprising it.

(i) The teeth are (*a*) in correct alignment. } Normal
(*b*) in correct occlusion. } occlusion.

(ii) (*a*) Either the teeth are not in correct alignment Fig. 4 (Fig. 6 in (4)), or
(*b*) The arch relationship is not correct Fig. 6 (Fig. 5 in (2)).
(*c*) A combination of (*a*) and (*b*).

These cases may be treated successfully by retaining all the teeth, because there is no deficiency in the amount of bone to contain them.

In the case of (ii) (*b*) there is a correlated abnormal shape of (a part or the whole of) the upper dental arch, and some deformation of the maxilla itself, but no deficiency in the amount of bone comprising the masticatory face.

B. The masticatory face and dental arches are smaller than normal.

If the masticatory face cannot be enlarged then it is not possible to maintain permanently all the teeth in good occlusion and alignment. Therefore upper teeth must be removed so that those which remain can be moved into good alignment, and will remain so permanently.

Theoretically the number of teeth in the lower arch should be reduced also, but for clinical reasons this is not desirable as a rule.

The evidence as to the size (normal or small) of the masticatory face is provided usually by the lower dental arch, a lower arch normal in size denoting a normal sized masticatory face, and a small lower arch denoting a small masticatory face.

It is not possible to use the lower arch as the standard of development of the masticatory face if the lower teeth are lingual to the upper teeth, either unilaterally or bilaterally : the upper arch, and any other indications that may be present, is used in place of the lower one to diagnose the development of the masticatory face : the treatment would be to widen the lower arch to correct the bucco-lingual relations and then to consider what, if any, should be the further treatment.

It will be noticed that the masticatory face does not play any part in diagnosis or treatment but it is used in the argument to explain why expansion of the dental arches by appliances is not a method of treatment with a good prognosis.

When Expansion of the Dental Arches is Indicated.

All cases, of whatever type, under treatment at the age when increase of natural arch breadth is occurring, should have the arches widened to take up the normal growth, unless the appliances are worn for a brief period only. In practice it is not necessary, or only occasionally necessary, to use a lower appliance Fig. 4 (Fig. 6 in (4)). This is not mentioned again, but must be assumed to be intended in all cases where it would be applicable.

Class I.

I do not treat typical Class I cases (small arches and a small masticatory face) with appliances if the alignment of the four upper incisors will be satisfactory : consequently I do not broaden the arches in these cases.

Possibly I would widen a Class I case of slight degree if apparatus is being worn for other purposes, and I could do it coincident with the other treatment.

I expand the upper arch in Class I cases if the teeth of one side are in lingual occlusion to the lower teeth. This condition is frequently found with a good lower arch (Fig. 7a), when all the teeth may be kept ; with a small lower arch extraction of an upper tooth or teeth is indicated as in a typical Class I case (Fig. 7).

If the lower teeth are lingual on one or both sides I expand the lower arch (unless the upper arch is too wide) ; I have seen only one example of the latter.

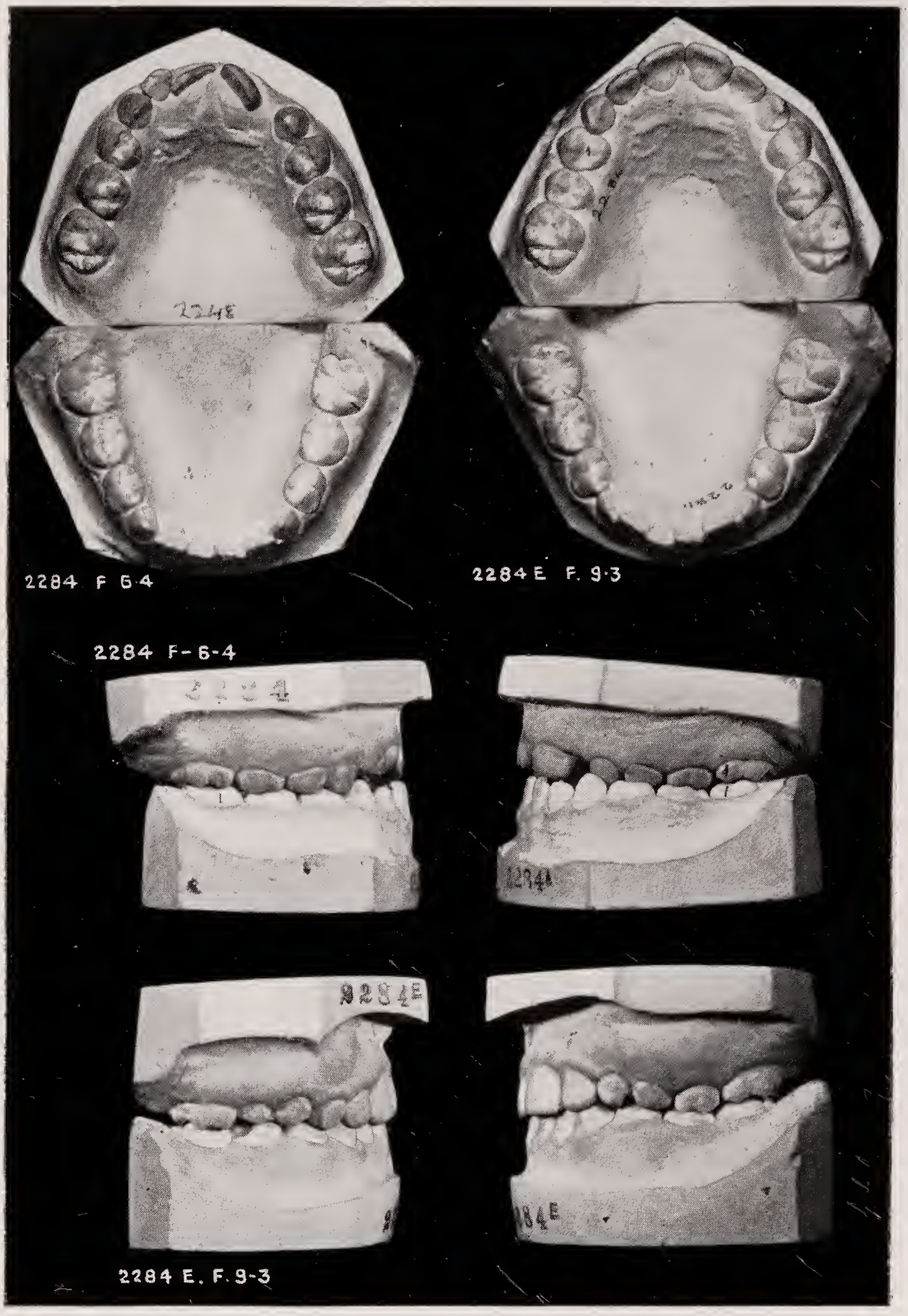

Figure 7a.

Figure 7

Chapman, Harold: Transactions First International Orthodontic Congress, 1926.

Class II, div. 1.

The treatment which I adopt (almost invariably) is to bring the mandible forward with intermaxillary traction: the upper arch must be widened to enable correct occlusion of the upper and lower teeth when the mandible is in the forward position.

In my experience the lower arch remains forward, the buccolingual relations of all the teeth remain correct, and the increased upper arch breadth remains; this means that the chief æsthetic defect is corrected: the retention of a perfect incisor relationship depends on other factors, e.g. the proclination in Fig. 6 (Fig. 5 in (2)) has remained corrected, but in a similar case started at age 12-6, the proclination has reverted though the retention was prolonged.

If the lower arch is a little small (as indicated by imbrication of the lower incisors) the upper arch relapses to correspond, so that the result as regards the upper and lower incisors is not perfect. Fig. 8 (Fig. 6 in (2)) is such a border-line case in which one may extract or not; both results have advantages. All the teeth have been kept in this case and the result is good, but there is some incisor imbrication. Fig. 9 (Fig. 7 in (2)) is an example of definitely small arches indicating a small masticatory face: upper teeth must be removed. Do not remove a lower tooth.

Class II, div. 2.

In these cases the upper and lower central incisor relations are correct, so it is not essential to bring the lower arch forward as in div. 1, but if it is brought forward the upper arch must be widened whether there is to be extraction of teeth or not, and this depends on the size of the masticatory face as diagnosed by the lower dental arch. The different treatments are:—

A. The mandible is brought forward.

Figure 10

Intermaxillary traction is not always essential. I do not often adopt this treatment. The upper arch must be widened to accommodate the lower arch in the forward position, and the upper centrals are moved labially. I have not sufficient experience to say if the result is always as good as in Fig. 10, which is not typical in the right upper lateral area.

If the lower arch is normal in size, indicating a normal masticatory face, extraction is not required (Figs. 10 and 11). The case seen in Fig. 11 would probably be retained without difficulty if the upper

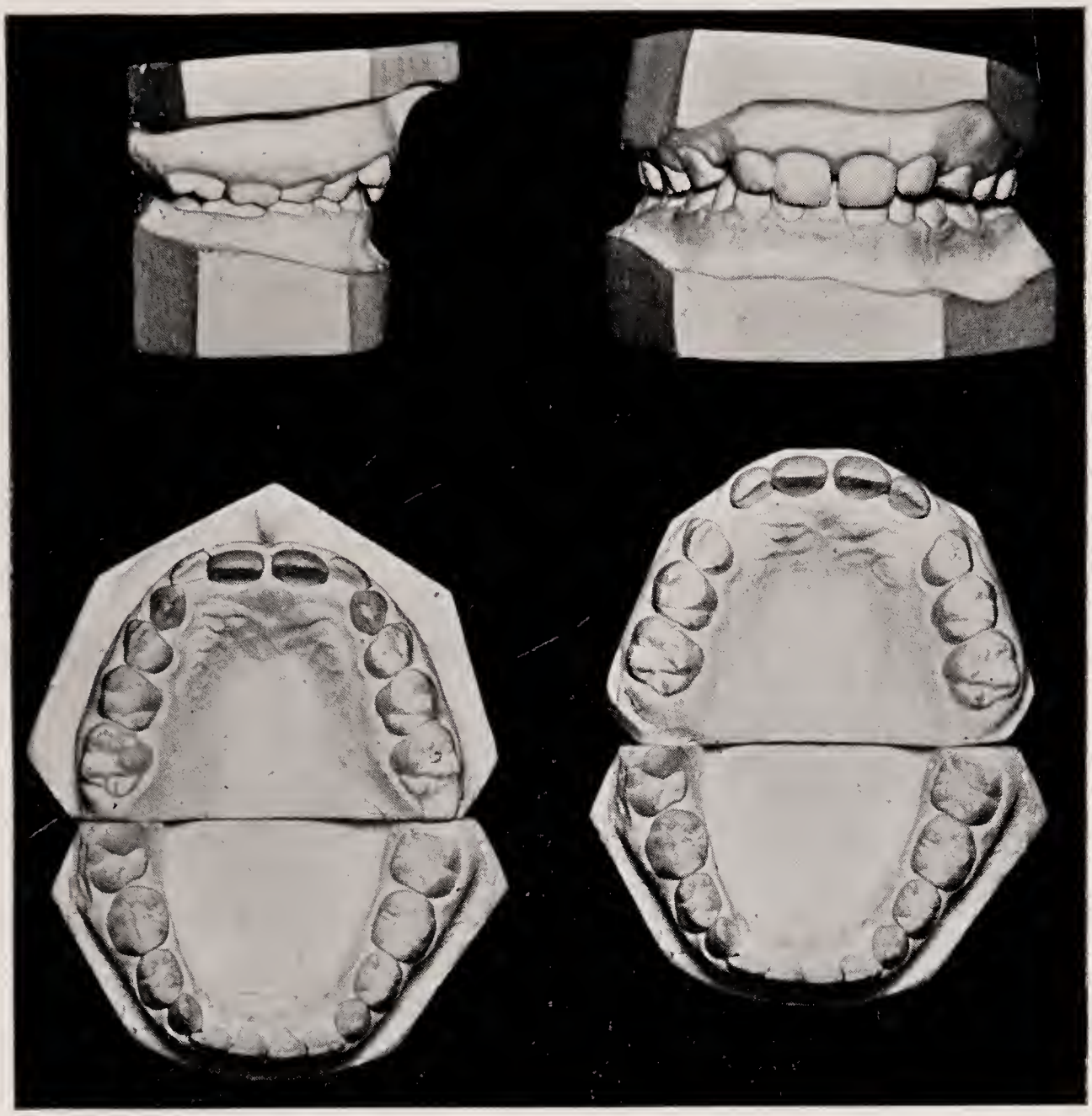

Figure 11.

arch had been widened and the upper central incisors moved forward, and the lower arch allowed to come forward naturally, or be brought forward with intermaxillary traction. This case was treated by extraction of the upper deciduous canines at age 7-11, when the upper lateral incisors went into line without treatment. The first upper premolars will be extracted later.

If the lower arch is small the upper arch is relatively smaller as in div. 1, and the loss of one upper tooth on each side is indicated, either a first premolar or a lateral : hesitate to remove a lower tooth.

The models of a Class II, div. 2 case, age 5-3, with a small lower arch are seen in Fig. 12 (Fig. 9 in (4)) : it was treated by keeping all the teeth, but there has been relapse of arch breadth and post-normality after normal relations of the teeth had been obtained by

treatment. The tendency of the upper cheek teeth to contract may cause the mandible to return to its postnormal position, and this may be assisted by the tendency of the upper centrals to relapse, whereas if upper teeth had been removed and the upper arch expanded to conform to the natural (smaller than normal) sized lower arch, and the lower arch not expanded more than it would have expanded naturally, the latter (lower arch) would probably have remained in its (new) forward position.

B. The mandible is not brought forward.

Increase of arch breadth by appliances is only necessary to take up natural growth.

Treatment.

(1) The first upper premolars are extracted.

(*a*) The upper deciduous canines are extracted as soon as it is seen that the laterals will occupy typical positions: the latter teeth may fall back into line without treatment (Fig. 11): if not an appliance is used. The premolars are extracted as soon as they appear.

(*b*) The first premolars are extracted and the canines and laterals retracted Fig. 13 (Fig. 5 in (1)).*

Figs. 11 and 13 both have good lower dental arches.

(2) The upper laterals are extracted: no further treatment is required; it is particularly indicated when the spaces for the laterals are very small.

(3) If the condition is slight it may be preferable not to treat it. Usually a lower tooth should not be removed, particularly if the case is not treated at all.

In the case No. 1361, of a girl age 13-1 with small arches, indicating a small masticatory face, extraction of upper teeth is necessary: the first upper premolars and right lower lateral were removed; the upper canines and laterals were retracted; the mandible was not brought forward. It would have been better to have treated this case earlier, and to have deferred extracting a lower incisor until much later. If this case were treated by bringing the mandible forward two upper teeth would be removed and the upper arch widened sufficiently to accommodate the lower arch in its forward position (the lower arch would not be widened, or only the amount it would widen naturally).

Class III.

The lower arch is taken as the criterion of the development of the masticatory face though it may be less reliable than in Class II cases. The upper arch is widened if this is necessary to bring the upper and lower teeth into correct bucco-lingual relations when the lower arch is in correct relation to the upper. The upper incisors frequently have to be moved labially.

There are border-line cases under these headings: each case must be decided on its merits, whether slight imbrication of upper incisors is preferable to extraction of upper teeth (or tooth) and better alignment. If appliances, upper and lower, are *in situ* for

* This is case No. 1753, M. æt. 14-7, otherwise as described.

definite purposes, e.g. in Class I cases for rotation of incisors, then the operator may select to endeavour to treat the case by keeping all the teeth, because he can resort to extraction later if necessary, but it should be remembered that it is better not to move teeth unless definite good is to result, and that improvement, if it can be obtained without appliances, has great advantages over that with appliances.

Undoubtedly all cases need individual consideration, but the indications for expansion of the arches, which I have enumerated will, I believe, give more satisfactory results than to follow implicitly the principle that a tooth should never be extracted. The basis of successful treatment is diagnosis, i.e. to be able to say what is normal, and to know what constitutes successful treatment in any particular case, or, in other words, to know what can be done successfully. My object has been to discuss cases which are met daily in practice.

SUMMARY.

Accurate diagnosis, particularly as regards the size of the masticatory face, which includes the apical base of Lundstrom, is essential.

The view is put forward that the size of the masticatory face cannot be enlarged by appliances more than it would enlarge naturally if appliances were not used.

The dental arch is part of the masticatory face, and, therefore, its enlargement is contra-indicated: however there are certain cases and circumstances in which the upper arch should be widened.

Cases may be placed in two groups:—

A. Masticatory face normal: all teeth may be kept.

B. Masticatory face small: extraction necessary of upper teeth to obtain and retain good alignment of the upper anterior teeth.

In postnormal cases the lower dental arch is relatively wider than the upper: if the postnormality is corrected by forward movement of the mandible the upper arch must be widened: this gives good results in Group A cases, and is believed to do so in Group B cases, but extraction of upper teeth must be a part of the treatment.

Expansion of the dental arches is indicated in:—

1. All cases under treatment at ages when natural arch breadth increase may be expected: both arches will be expanded, the upper more than the lower as occurs naturally.
2. Class I cases of slight degree if appliances are worn for other purposes.

When expansion of the *upper* arch is indicated:—

3. Class I cases with upper teeth unilaterally in lingual occlusion.
4. Class II cases—if the lower arch is brought forward, the upper arch must be widened to accommodate it. In addition, extraction of upper teeth must be resorted to if the masticatory face is small, as if all the upper teeth were kept they could not be retained in alignment.

   This treatment is almost invariably adopted for div. 1; for div. 2 there are alternative treatments.

5. Class III—the upper arch may need to be widened to accommodate the lower arch.

When expansion of the *lower* arch is indicated :—

6. When the lower teeth on one or both sides are lingual to the upper teeth.

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(3) Idem, "Abnormal Vertical Position of Deciduous Molars" (the latter part of the article referring to Fig. 7 of the article), *Trans. of European Orthodontic Society*, 1937, and *Dental Record*, October, 1937, p. 546.

(4) Idem, "Failures in Orthodontic Practice," *Trans. B.S.S.O.*, 1937, and *Dental Record*, February, 1938, p. 57.

(5) Idem, "What is Normal as Regards Occlusion," *Trans. B.S.S.O.*, 1938, and *Dental Record*.

WHAT IS NORMAL AS REGARDS OCCLUSION*

By Harold Chapman, L.D.S.Eng.

OCCLUSION in this paper includes arch size, shape, and relationship ; also alignment of teeth : there are three definite periods in which these factors have to be considered :—

(i) The deciduous dentition ;
(ii) The permanent dentition ;
(iii) The mixed dentition or intermediate period when teeth of both dentitions are present.

It is significant how our knowledge of normal occlusion has increased in the last fifteen years, though superficially one would expect it to be common knowledge to all dentists—perhaps it is because the profession has believed it had this knowledge that it is so slow to realise that it does not in fact possess it.

In 1926, Friel[5] published diagrams of (i) and (ii), but doubtless to-day he would modify or supplement them†. Some years ago Sir Norman Bennett told the writer that he did not think a chapter on normal occlusion should be included in a book on orthodontics : it is probable that he is of a different opinion to-day. Recently a colleague, who had in mind to start an orthodontic study circle, wrote one of our members that normal occlusion presented no difficulties because it could be obtained from books.

* Read before the Society, February 7th, 1938.

† Dr. Friel informs the writer he has added a couple of small details and has altered two points (a) the deciduous incisors need not be in proximal contact with each other, and (b) the inclination of the labial surfaces of the deciduous and permanent incisors is nearly the same. ("Changes in Occlusion of the Teeth of Diagnostic Importance in Orthodontics."—Dental Record, 1938, page 233.)

These may be regarded as indications that there is a lack of knowledge as to what constitutes normal occlusion : the object of this paper is to help towards a better realisation of normal occlusion.

Lack of knowledge and appreciation of the normal does not apply to orthodontics only. Here is a quotation from a paper by Dr. Worth[6] which, with very little paraphrasing, is as apposite to orthodontics and normal occlusion as to radiology :—

> " . . . every person who is to undertake interpretation of radiographs should have a complete knowledge of the normal appearances in order to be able to recognise the abnormal.
>
> " Every experienced radiologist knows how difficult it is to have a complete knowledge of all the normal variations, and every teacher of radiology knows that his pupils usually wish this part of the subject to be ' taken as read.'
>
> " It has been observed that the interest in the normal appearances varies directly as the experience in radiology.
>
> " It is safe to say that one has never met all the variations of the normal that nature prepares for us, but with a reasonably complete knowledge in one's grasp, it next becomes possible to recognise the abnormal . . . . "

The writer has paraphrased this extract as follows :—

Every person who is to undertake orthodontic diagnosis should have a complete knowledge of the normal appearances in order to be able to recognise the abnormal.

It is difficult to have a complete knowledge of all the normal variations and every teacher knows that his pupils usually wish this part of the subject to be " taken as read."

It has been observed that the interest in the normal appearance varies directly as one's experience.

It is safe to say that one has never met all the variations of the normal that nature prepares for us, but with a reasonably complete knowledge in one's grasp, and with experience, it becomes possible to recognise the abnormal and to make a correct diagnosis.

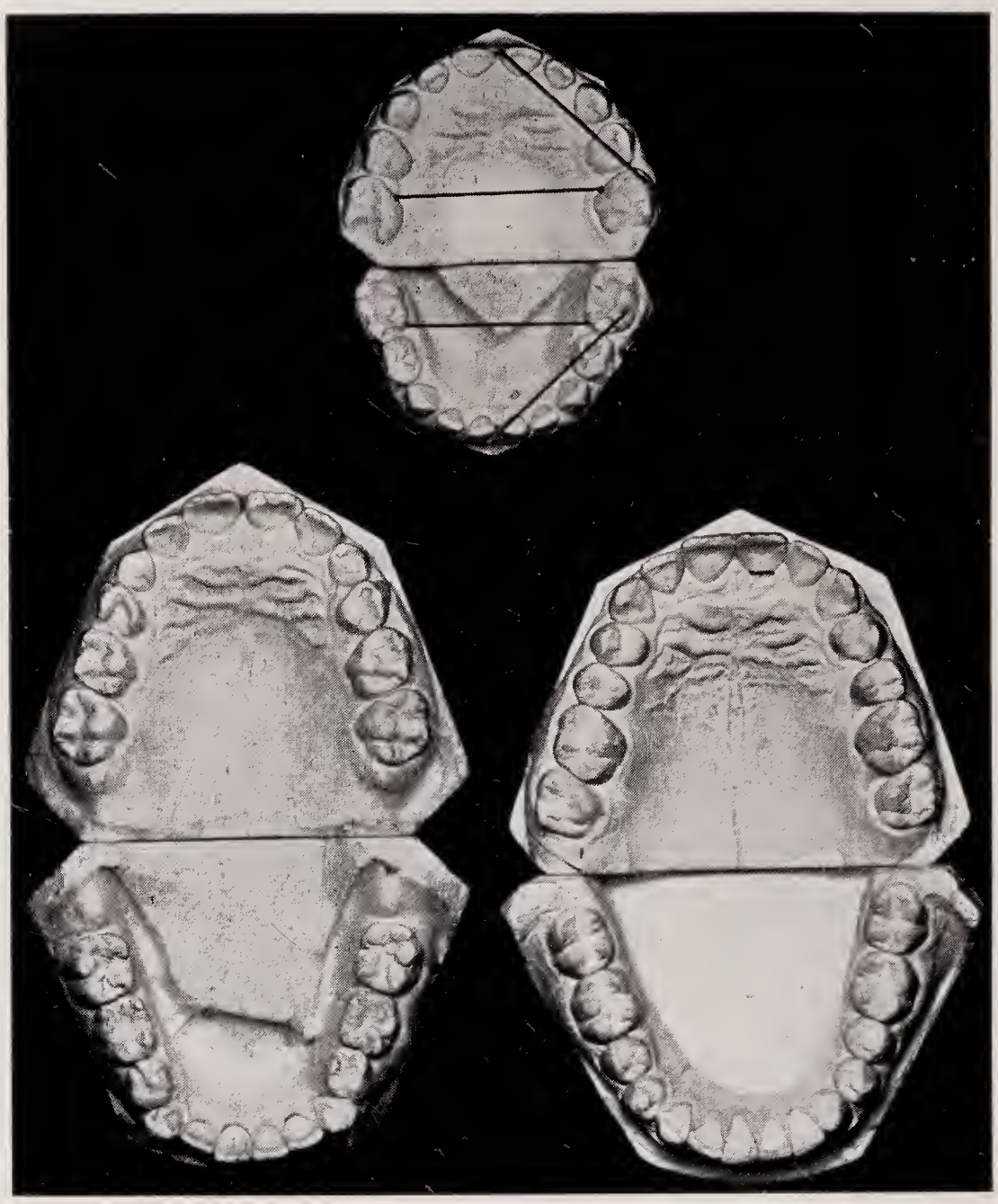
For many years the writer believed alignment of teeth followed a particular and invariable pattern. Fig. 1, is the case on which he based his original ideas of normal : consider one factor only, the alignment of the lower incisors—at each age for which models are available it is perfect, and it was believed that it was never otherwise in any case of normal occlusion ; then he found that various conditions became similar to Fig. 1 (aged 20-21) in later life, all without treatment :—

(*a*) The laterals are lingual to the centrals and canines Fig. 2 (Fig. 5 in (4)).
(*b*) The laterals are labial to the canines (Fig. 3).
(*c*) One lateral is lingual to a central and canine, whilst the other lateral is labial to the canine (Fig. 4).

The separation of upper permanent central incisors Fig. 5 (Fig. 1 in (1)) was regarded as an abnormality not very long ago (and has often been unnecessarily treated) but is now regarded as normal.

Similarly the four types of alignment of lower incisors in the cases referred to above are normal : likewise any other condition which is followed by normal occlusion in the permanent dentition, though,

AGE 4–0.



AGE 9–2 AGE 20–1.

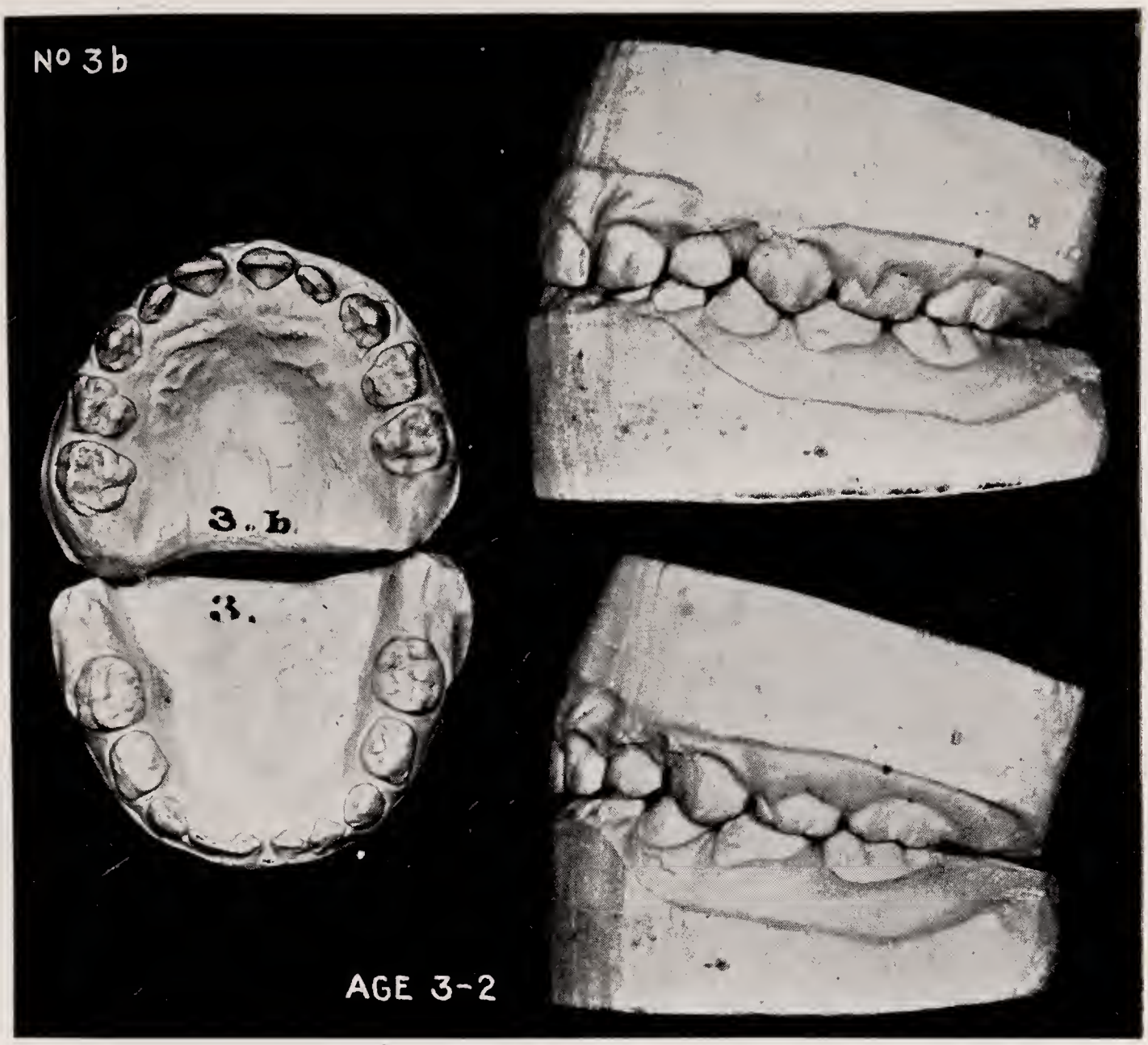
Figure 1

Chapman, Harold: Transactions British Society Study Orthodontics, 1914 *and* 1934, *and "Dental Record." Vol. XXXV,* 1915 *and Vol. LIV, Dec.,* 1934.

with our lack of knowledge and experience in regard to the natural changes which occur, we may be tempted at first sight to regard them as abnormal.

It must not be thought (as the profession has tended to in the past) that normal occlusion is one definite, invariable arrangement (arrangement in this connection includes alignment), particularly in the "mixed" dentition where it assumes various aspects; it would not be satisfactory to call these different arrangements "variations" as this might lead to the inference that one arrangement only is normal—there is not enough information to say the percentage of cases in which certain arrangements occur, as has been done in the case of osteology, e.g. the position of definite anatomical features on bones.

Age also is an essential point for consideration in this connection: e.g. the arrangements of the lower incisors in Fig. 2 (Fig. 5 in (4))



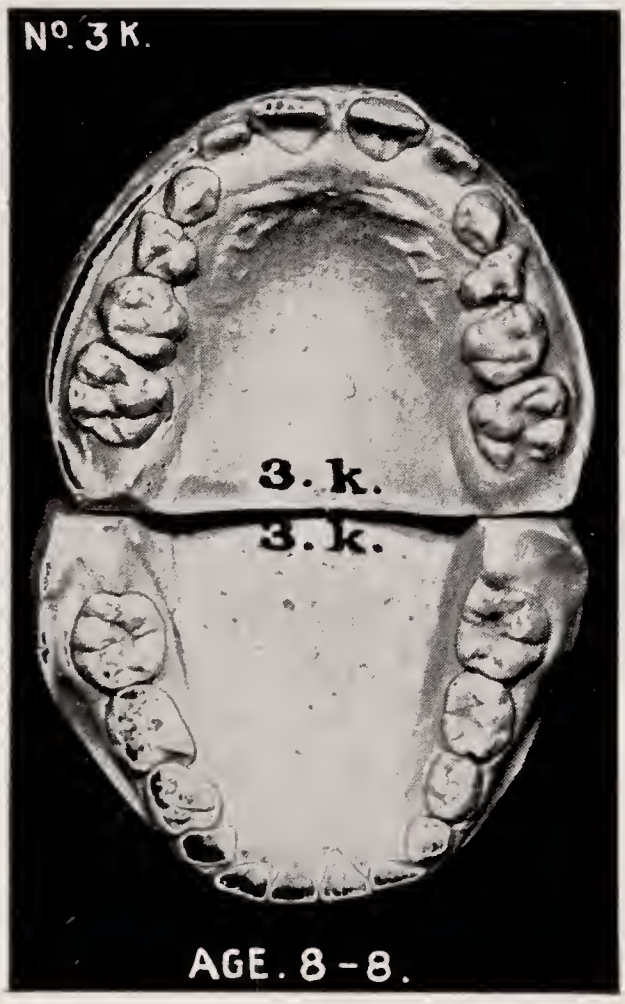


Figure 3.

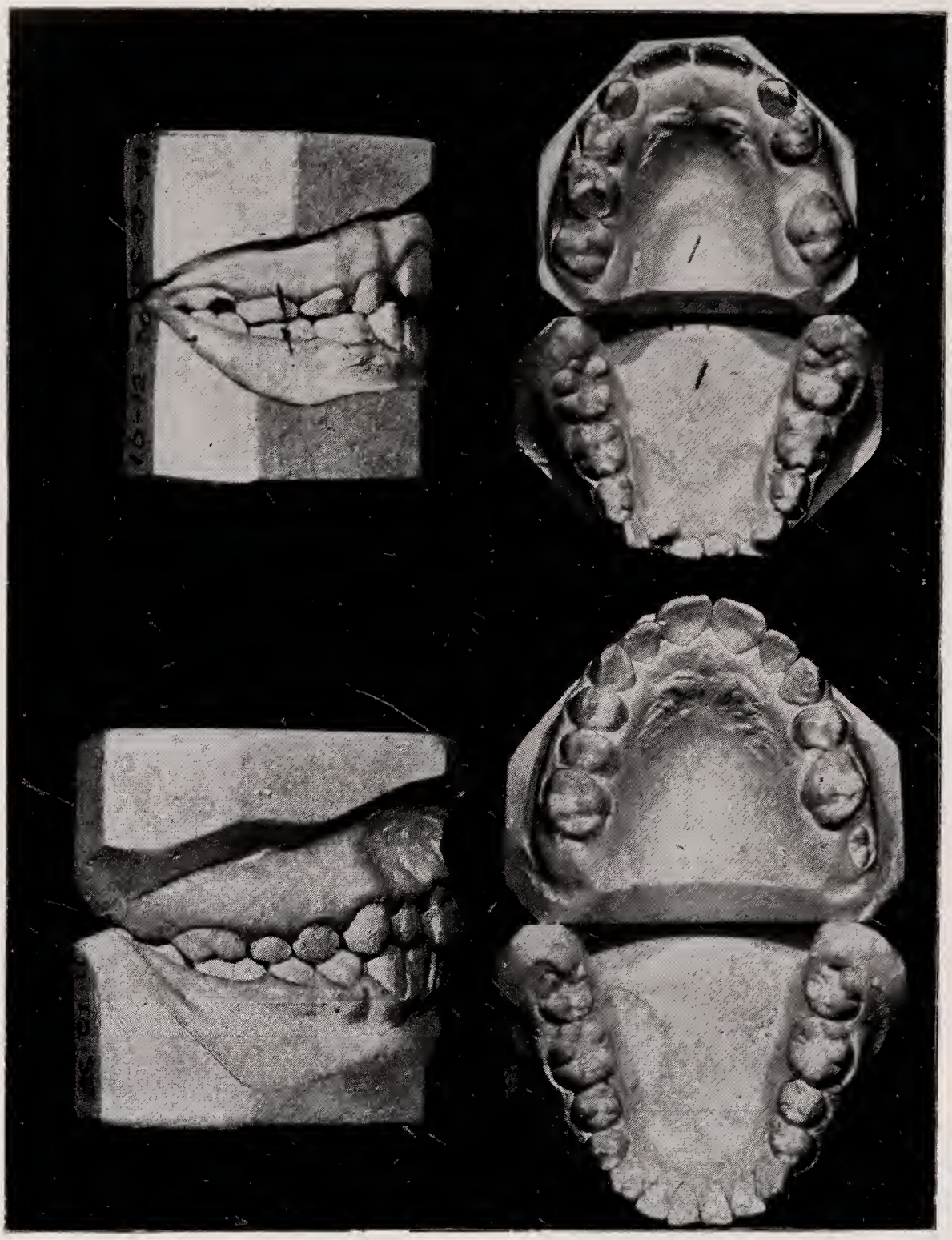


Figure 4.

Chapman, Harold: Transactions British Society Study Orthodontics, 1937, and Dental Record, July, 1937.

at age 6-8 is normal, but the same arrangement at age 16 is abnormal. Friel[5] has pointed this out in regard to molar occlusion.

This is a matter of more than academic importance because a condition which is diagnosed as abnormal but is in reality normal may :—

(*a*) Cause treatment to be undertaken unnecessarily, e.g. separation of upper central incisors.

(*b*) Vitiate any statistics in which it is included or from which it is excluded.

The blocks for Fig. 3 have been kindly lent by the British Dental Association. The illustrations appeared in the *British Dental Journal*, March 1st, 1935.

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Discussion on Mr. Chapman's Two Papers

The President said she was sure all the members had enjoyed Mr. Chapman's Communication. She could not help thinking, as she listened to it, of a case in which a distinguished Edinburgh surgeon, advanced in years, made a certain diagnosis and recommended a certain treatment, and a young surgeon made a quite different diagnosis and recommended a different treatment. The young surgeon's treatment was accepted because the patient said he was more up to date. The results were disastrous, and the old surgeon said : "I may be old but I have experience." She thought Mr. Chapman had shown that evening the value of experience. Orthodontists sometimes could not judge the results of their treatment until many years had elapsed. Mr. Chapman had shown the case of a patient who had reached the age of 29 ; when a patient reached that age an orthodontist could judge the results of his treatment, although it was too late to alter it.

Mr. H. C. Visick said that Mr. Chapman's Communications were always provocative. He felt that he wanted to question what Mr. Chapman said, but he was rather afraid of doing so in the present instance, because he knew that Mr. Chapman had had much experience in the subject and would probably upset his ideas. He would have liked Mr. Chapman to show what he considered to be an abnormal lower arch. He had shown four lower arches, which he said were normal, three of which appeared to be abnormal ; they were crowded and would make him feel nervous about the future appearance of the arch if he left them alone. He would not hesitate to expand them, but he supposed Mr. Chapman would think that that would be a waste of time. He would like to know how much more they would have to be crowded for Mr. Chapman to consider them abnormal. Was it purely guesswork or had Mr. Chapman any measurements that he could give ? He would also like to ask how Mr. Chapman diagnosed whether the masticatory face was normal or subnormal. Was it from the shape of the arch, the size of the arch or the crowding of the teeth, or did he look at the face as a whole and decide that the lower part of the face appeared small as compared with the cranium ? In one case that he had shown, Mr. Chapman had taken the final impression when the patient was 29 years of age, and he said that in a similar case now he would extract two upper premolars, but he said nothing about the lower jaw. In the final models the case appeared to him almost like a Class III case, the upper incisors being edge to edge or almost behind the lower incisors. If Mr. Chapman had taken out an upper first premolar on each side, surely it would have been a real Class III case unless he had taken out two teeth in the lower jaw as well. It seemed to him that all through his remarks Mr. Chapman ignored the lower jaw. Personally he had not taken out a lower incisor for quite a long time, since Mr. Chapman had shown some years ago that it was wrong

to do so. He always felt that a lower incisor could be taken out later on ; the space would close up at almost any age, so he was not in a hurry to extract lower incisors now. But surely in many of the cases which Mr. Chapman had shown, if they were Class I cases, if one extracted an upper tooth one must extract a corresponding unit in the lower jaw. Perhaps Mr. Chapman would say whether he ever extracted in the lower jaw. In referring to expansion did Mr. Chapman mean only lateral expansion and not general expansion.

Mr. CHAPMAN in reply to Mr. Visick said he had not wanted to make his Communication too long, it being intended only to supplement something that he had said at previous meetings of the Society. The first cases he had shown were all normal, but he had not known that they were going to be normal. With regard to the second case, he had said to his colleague : " I should leave that alone ; I think probably it will get better." Actually it became normal, as will be seen from the illustrations. But, supposing it had not been normal, then it would have been a Class I case ; there was crowding and it would not widen sufficiently for all the teeth to get into alignment. He could then take out two upper premolars, and the upper incisors would have room to align themselves, but he would not take out any lower teeth, because the lower arch might, in all probability would, contract and the upper one also would contract, and the teeth might overlap. He would keep a solid lower arch, irrespective of the alignment, in order to ensure that the upper incisors would have room and would not be squeezed. In brief it was either normal or a Class I case. If it was normal, one did nothing. If it was a Class I case, then only two upper premolars need be taken out. He thought he was able to diagnose a good many of such cases now, but he was constantly getting surprises. That was why he asked all the members to read Dr. Worth's words, which really were applicable in an extraordinary degree : " It has been observed that the interest in the normal appearances varies directly as one's experience." The more experience one had the more one began to realise what the normal was. Dr. Worth said : " Every teacher knows that his pupils usually wish this part of the subject to be ' taken as read ' " ; they were not interested in the normal ; it did not require treatment ; the patients did not have to come back and have something done. If there was a good lower arch, the diagnosis was easy. In postnormal cases all one had to do was to widen the upper arch and to bring the mandible forward and the increased upper arch breadth remained : that was his experience. In the case to which Mr. Visick had referred, it was true he had said he would remove two premolars, but that was in the light of further experience and because he had seen the result. If the four upper incisors were in good alignment but the canines would not have room, he would remove the two first upper premolars. That would save the wearing of appliances for three years. The boy had measles and his plates were taken out and the arches relapsed. Then he recovered and subsequently he contracted scarlet fever, and the doctor said that the plates must be left out. When the doctor came to the house the plates were out, but they were never out at any other time, so that the parents played *their* part in the treatment of the case. He thought the lingually placed incisors were a stage in development ; they did not affect the problem as a whole. The lower arch was in nearly all cases the criterion, but if all the lower teeth were lingual to the upper ones and there was a good upper arch he would be inclined to say that the upper arch might be the criterion for diagnosis. He did not think that the prognosis in the latter case would be so good, but, he would widen the lower in order to get satisfactory occlusion. There were several abnormal, i.e. small

lower arches in the Class II cases that he had shown, and there was also an abnormal, i.e. small lower in the Class I case, the patient whose final impression he took at the age of 29. When he referred to expansion he had meant lateral expansion. He had not meant the pushing forward of the front teeth, but of course he would do that at times. He had written some explanatory notes in regard to that in his full Communication, but he had not read the whole of it.

Dr. E. S. Friel said that a few days ago he had received two journals, the *British Dental Journal* and the *Dental Record*. In the first there was a paper by Sir Norman Bennett and in the second there was another by Mr. Harold Chapman, two very eminent people with diametrically opposed views. Sir Norman Bennett said in his paper that orthodontics were quite simple, that specialists made a great deal of fuss about appliances, such as bands, and that all that could be saved by putting in a few simple removable appliances, except in very rare cases. Mr. Chapman in his paper bemoaned the lot of the orthodontist in that arches could not be expanded. His answer to Sir Norman Bennett was that he felt he himself must be becoming more stupid every year, because he found orthodontic treatment very much more difficult than he used to find it, and his answer to Mr. Chapman was that he thought Mr. Chapman would not take quite such a pessimistic view after his annual holiday. He agreed with Mr. Chapman that the lack of knowledge of normal occlusion was the basis of a great deal of the trouble that was experienced, and it was a very difficult subject. Mr. Chapman had mentioned him by name and had said that he might not agree now with some of the diagrams that he had published a few years ago. Mr. Chapman had suggested that he (the speaker) would amend or amplify them. He possibly would. He disagreed with Mr. Chapman's statement that the cases in question were normal. He thought they were abnormal at the time. The child had recovered from the inhibition of growth and had grown and had become normal, which was a very different thing from being normal always. When a person was ill and recovered, one did not say that that person was normal while he was ill, but he became normal when he recovered. There was a great number of small stages of normal development which were not understood. He had a series of models of a boy from four to fifteen years of age, and there were a good many small variations, but none which he would treat as an irregularity. He thought Mr. Chapman had done a great deal of good in bringing forward his Communication, which was really an extension of Dr. Lundstrom's work on the apical base. It was very difficult to know when an apical base was too small. Apparently Mr. Chapman judged it from the lower jaw, but that did not seem to him to be correct, because there were pseudo-Class III cases in which the lower jaw was perfectly normal but the upper jaw was far too small. He did not think that could be regarded as being a normal masticatory face.

Mr. C. S. Morris suggested that, in Class I cases, if two upper premolars were taken out and nothing was done in the lower jaw there might be some spacing in the top teeth.

Mr. Chapman, in reply to Mr. C. S. Morris, said he thought that the spaces would close. He was glad that Dr. Friel had taken part in the discussion. The views expressed in the two journals to which Dr. Friel had referred appeared to be diametrically opposed, but if they were read carefully his meaning would be understood. At a recent meeting (not a meeting of this Society) two very eminent people said that if an expansion plate was put in for six months a great deal of good could be done. He ventured to say that that was a fallacy;

he did not think that an expansion plate worn for six months was any good at all. The basis of some of the difficulties experienced by orthodontists was undoubtedly (1) a lack of knowledge of what was normal, (2) diagnosis and (3) possibilities of treatment, and he was very glad that the profession was beginning to realise this. As Dr. Worth said in his paper : " It is safe to say that one has never met all the variations of the normal that nature prepares for us "—he regarded the cases he had shown that evening as variations of the normal— " but with a reasonably complete knowledge in one's grasp and with experience it becomes possible to recognise the abnormal and to make a correct diagnosis." He thought that applied absolutely to orthodontists. The further question then arose as to what orthodontists could do. He had pointed out the treatments which he had found to be successful, and he thought this was a matter on which orthodontists might agree. He hoped they would agree on what was normal, but, if they agreed only on what could be done, and did not believe that every case could be made normal, with a beautiful set of perfectly occluding teeth (he thought the sooner they got rid of that idea the better), they would do some good. He would remind the members again of the simple example of the two separated upper central incisors ; he did not suppose that anyone present would say they were not normal.

Mr. F. Bocquet Bull said he thought they were abnormal.

Mr. Chapman said his opinion differed from that of Mr. Bull. He held the same view with regard to the lingually placed lower incisors in the cases he had shown that evening. He had brought that question up again because he hoped that it would induce the members to think further about it. He was putting into practice the view he had expressed that evening, and he believed that he was making far fewer mistakes than he had done in the past.

Mr. F. Bocquet Bull said that, in amplification of what he had just said, he would like to show at the next meeting some models of a case in which there was a well marked median diastema with the laterals through, well rotated. He did not think that, when teeth erupted in that position, it was right to leave them there unless it could be shown that they would gradually drift together, but he was sure that they did not always drift together.

Mr. Chapman, replying to Mr. Bull, said he had not meant that the spacing was normal in every case. He knew that there were cases in which the upper central incisors were permanently separated and if they were brought together he did not think one could make them stay together. He had read a paper before this Society on the subject and illustrated it by cases of adults with separated central incisors, with their X-rays, showing the different radiographic appearance between the two centrals. He would repeat that if one left them all alone one would make far fewer mistakes than if one brought them all together : in fact the possibility would be that there would not be one mistake.

Mr. W. J. May said he had understood Mr. Chapman to refer only to the particular cases he had shown on the screen when he said that the spacing was normal in all cases. He agreed with Mr. Chapman as to the cases he had shown, but he agreed with Mr. Bull that in a few cases the teeth would not come together.

Mr. H. G. Watkin said he wished to call attention to the influence of the tongue on the size of the masticatory face. If the lower teeth were imbricated this indicated a small tongue and the tongue could not expand the lower jaw. As the tongue grew it pushed the anterior teeth forwards. A spring might be applied to bring about the same

result, but if the case was left alone nature would do it instead. It was interesting to bear in mind the force used to control the final position of the teeth. Bimaxillary crowding was probably due to a small tongue ; therefore the number of teeth in the arch must be reduced in order to make it fit round the small tongue. If the teeth were separated with a good wide arch at the bottom, all the top teeth should be kept, because the bottom arch was maintained by the tongue. If the teeth protruded too far, the tongue was too large and was pushing them out, so the size of the tongue should be reduced. At a future meeting of the Society he hoped to bring forward a case in which that had been done with absolutely satisfactory results.

Mr. W. Headridge said he could not altogether agree with Mr. Watkin's remarks on the tongue, because there was a considerable number of cases in which one found a large tongue in a small arch and very often the teeth marked the side of the tongue. He would like to ask Mr. Chapman whether X-rays were taken of the cases in which he expanded the arch, because he thought that the expansion and growth of the arch had a great deal to do with the growth of the sutures. If there was an early ossification of the sutures, it was no use expanding the arch. He believed that some time ago Dr. Collier had shown some X-rays of a maxilla and premaxilla which, at the time of the eruption of the canine teeth, had developed a secondary suture. If there was an early closing of the premaxilla and the maxilla suture, that secondary suture did not occur. He thought on that point one had to decide whether to expand the arches or not.

Mr. Chapman said that X-rays had not been taken in the cases to which Mr. Headridge referred, but he thought Mr. Northcroft had had a similar case in which he had taken X-rays.

Mr. R. G. Daplyn suggested that possibly the normal in one person was not the normal in another and that orthodontists should pay more attention to their diagnoses and obtain more material for their diagnoses before they came to any definite conclusion. They should get impressions of the patient and leave the case for some little time and find out what the natural tendency was before they contemplated any treatment at all.

Mr. N. J. Ainsworth said that Dr. Friel had raised a point which he had intended to mention. In the last three cases which Mr. Chapman had shown the lower arch was not only normal but U-shaped. The cases in which there was a small U-shaped upper arch, the canines tending to erupt almost over the apices of the upper laterals and all the posterior upper teeth tending to be lingual to the lower, seemed to be very definitely cases in which the upper masticatory face was small and the lower one was larger. Would Mr. Chapman take the lower as the criterion of the size of the masticatory face in such cases ?

Mr. Chapman said he was very glad that Mr. Daplyn had suggested that the normal was not the same in different people. That was only putting in other words what he had read from Dr. Worth's paper. There were exceptions, as he had said in his Communication. There were cases in which there was an extremely small arch, either lower or an upper, but he was trying to deal with the everyday cases that one came across and not with the rather exceptional ones, and the cases to which Mr. Ainsworth had referred were, at any rate in his own practice, extremely rare. He did not know whether he could produce two or three if he were asked to do so. He was quite willing, however, to concede the point that one could have a big lower and a very small upper in Class III cases. He had a case of a boy with a poor maxilla but with a bird-like mandible. He had not intended to deal, however, with very abnormal cases, and he put those cases into that category.

A considerable number of Class III cases, he thought, could be treated by keeping all the upper teeth, but a case which was not an average one required exceptional treatment. Reverting to Dr. Friel's remarks, he did not know whether it was possible for the growth of the jaws to be retarded through some post-natal illness. If it were possible (and he presumed it was) he very much doubted whether that retardation of growth could be made good later on. On the other hand, unless the illness was of long duration, it (the illness) would have little appreciable (measurable) effect, because the arch breadth increase in any individual, however good the health, in six months was almost nil : he did not say this with the idea of belittling the arch breadth increase or bone growth, but to point out that it must be rare for an illness to have such an effect on jaw growth that the effect of such illness could be appreciated by the practitioner. There was to be a meeting of the European Orthodontic Society in London this year, and he had been trying to find someone who would present a Communication on that subject. He did not suppose it would be possible to have it dealing with the jaws, but he would be glad to have such a Communication dealing with other bones. If any member knew a physician or surgeon who would read such a Communication he would be very glad, as he felt this question was one which required investigation.

Fractured Incisor Teeth*

By F. Bocquet Bull, M.R.C.S.Eng., L.R.C.P.Lond., L.D.S.Eng.

W. W., a male, æt. 9 years.

In May, 1934, the patient fell on his face. His mother, on examination, found that he had fractured both central incisor teeth, the mesial angles in each case being lost. She also noticed that the lower lip was lacerated. Unfortunately the patient was involved in a road accident the following day, which necessitated him becoming the in-patient of a hospital for a month. He was brought up to the dental department of Guy's Hospital in August, 1935, some fifteen months later, to see someone about "the tooth in the lower lip." It is presumed that the reason for the mother making this statement was the fact that complaint was made by the patient of a pricking sensation in the lower lip. On examination the lip was found to be slightly swollen in the region of the mid-line. Two firm and hard bodies, one of which consisted of cicatricial tissue, could be felt in the swollen area. An X-ray examination showed a piece of tooth present in the lip. On October 1st, 1935, the fragment was removed under a general anæsthetic.

Although in this particular case the accident did not happen to a child having central incisor teeth with prominent mesial borders, it is usually children with this type of irregularity who, by accident, tend to fracture these teeth. For this reason I have brought it to your notice this evening. The case tends to be one of interest, not only from the fact that a piece of one of the fractured teeth was forced into the lip, an unusual event, but that circumstances occurred which permitted complete healing of the lip with the fragment still embedded in it.

* Read before the Society, February, 1938.

Discussion

Mr. Robert Cutler said he could recall the case of a motor cyclist who had a very severe accident quite near to a cottage hospital, some miles from London. He was taken into the hospital and was found to have several injuries—a gash in his arm, abdominal injuries, and certain injuries to his skull, which necessitated an immediate decompression. He presumed that the senior surgeon in the cottage hospital did the decompression and the house surgeon dealt with the other injuries. About a year later the patient presented himself at a London hospital again. He had recovered from his cranial injury but he had a very large and hard swelling on his arm, the exact nature of which no one could determine. An X-ray was taken, and the whole of the brake handle of the patient's motor cycle was found in his arm!! It was removed and the patient made a complete recovery.

Mr. H. G. Watkin said that in all such cases as Mr. Bull had described the lip should be X-rayed at once. A friend of his had had a painful thigh with a hard swelling in it, and nine inches of a pitchfork were taken from it. He had fallen off a haystack on to the reared up pitchfork.

The President tendered the thanks of the Society to Mr. Chapman and Mr. Bull for their Communications and to all those who had taken part in the discussion.

THE MALOCCLUSION OF A FAMOUS HORSE*

By Sheldon Friel, Sc.D.

IRREGULAR teeth in animals are not uncommon, even in the wild state. Colyer, in his book, shows irregularities in every type of animal. The malocclusion in this particular horse is interesting because it seriously interfered with mastication and also because he was such a famous horse. I am indebted to Mr. Freeman, M.R.C.V.S. for the loan of the skull and for all the information.

My Prince, a big upstanding bay horse, was foaled in 1911, and was by Marcovil (by Marco, a son of Barcaldine), out of Salvaich, by St. Simon out of Muirninn (sister to Violet Melrose, the dam of Melton), by Scottish Chief, out of Violet, by Thormanby. As a two-year-old he ran five times without success, but at three years he won three races value £2,634, including Union Jack Stakes, Liverpool, Tudor Plate, Sandown and Gordon Stakes (1½ miles), Goodwood, and walked over for the Whip (2 miles) at Newmarket at four years old. In October, 1915, he came up for sale at Newmarket, with a reserve of a hundred guineas, but nobody would bid it while he was in the sale ring. The British Bloodstock Agency, however, purchased the horse at his reserve price before he left the sale paddocks, and two months later sold him to the Irish Board of Agriculture at a profit of 100 per cent. The horse, of course, was ridiculously cheap, but it was war time and speculation in bloodstock was a rather risky business. On reaching Ireland My Prince became the property of Mr. A. H. Maxwell, at whose stud at Lusk, Co. Dublin, he gained fame as a sire. My Prince commenced his stud career in 1916 and in 1920 his first winners appeared, these being the two-year-olds Laverock and Time. Laverock, by the way, bred several good winners when she was retired to the stud, and Time proved to be the best flat performer that My Prince begot during his lifetime at the stud. From 1920 onwards My Prince featured regularly in the yearly list of winning flat race sires and to the end of 1936 his stock won ninety-one races in England and Ireland of a total value of £16,700.

As in the case of Ascetic, My Prince proved to be a far better sire of jumpers than of flat racers. His career as a sire of jumpers from August, 1922, to July, 1937, shows that he sired 102 winners of 83 hurdle races and 113 steeplechases of a total value of £60,089. He has established a record in that his stock have won four Liverpool Grand National Steeplechases, his winners being Gregalach in 1929, Reynoldstown in 1935 and 1936, and Royal Mail in 1937. Reynoldstown's feat in scoring two years in succession was exceptional inasmuch as 66 years had elapsed since a horse had achieved such fame. My Prince's record as a sire of

* Read before the Society.

Grand National contenders is likely to last for some time. It reads thus :—

1929—Gregalach first and Easter Hero second.
1931—Gregalach second.
1935—Reynoldstown first and My Prince's grandson Bachelor Prince, third.
1936—Reynoldstown first.
1937—Royal Mail first.

In addition to the aforementioned, My Prince was also sire of other exceptional jumpers such as Royal Ransom. From this you will see that he was a remarkable thoroughbred horse. Not only did he win many races himself but his progeny were even more successful. He had a severe type of malocclusion that prevented good mastication as evidenced by the amount of tartar present and probably accounted for his continuous digestive troubles. He would feed well for a couple of weeks and then go completely off his feed. He would have to be dosed to relieve his indigestion. He was bad-tempered and would not allow a rasp to be used on his teeth. The veterinary surgeon considered he was too valuable to dope and throw as he might get injured. It is doubtful if much good could have been done with the rasp and that it would have been necessary to remove several teeth. He had already lost several.

In the skull, you will notice that he suffered from some bony lesion. The skull is very light as is the case with most thoroughbreds. In many places as thin as paper. The bony lesion is probably osteomalacia due to a faulty ratio of the phosphorus-calcium balance.

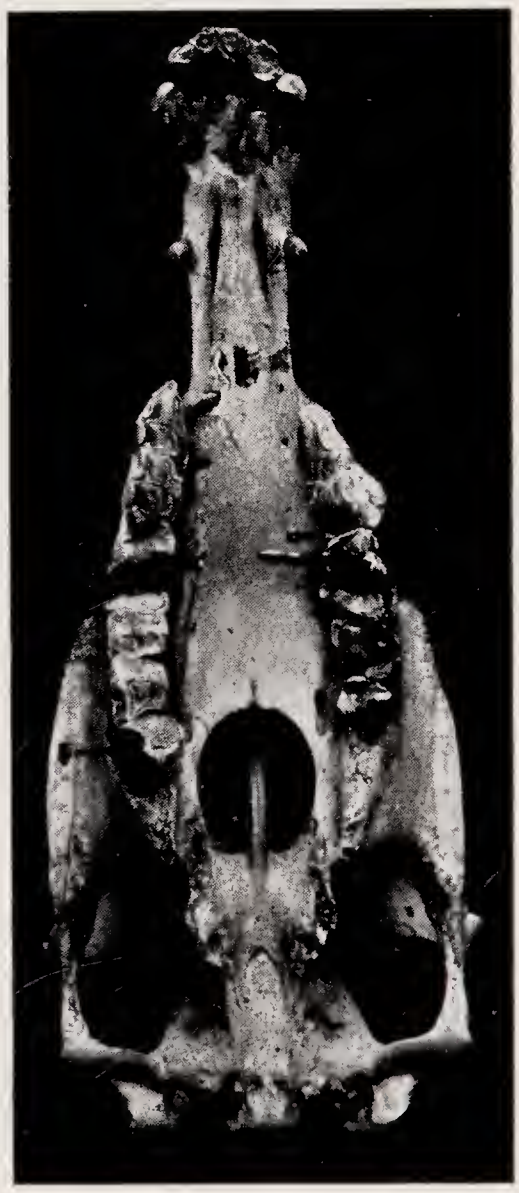

Fig. 1. Skull viewed from below.

Fig. 2. Mandible viewed from above.

Fig. 3. Skull and mandible, teeth in occlusion viewed from below.

Fig. 4. Incisors viewed from in front.

Fig. 5. Right profile, teeth in occlusion.

Fig. 6. Right profile, teeth a little apart.

Discussion.

The PRESIDENT said she was sure all the members had been very interested in Dr. Friel's short communication. The malocclusion of the horse did not seem to have affected its vitality or the vitality of its offspring, though she would like to know whether its condition showed any sign of deterioration.

Mr. H. C. VISICK asked whether Dr. Friel had any suggestion to make as to the cause of the trouble. It struck him that the queer peak in the lower teeth prevented proper movement of the mandible, and that led to its malformation.

Mr. H. G. WATKIN said he had been consulted about a similar case of a prize dog whose lower incisors were wrong. He did not see the dog himself, but a dentist sent him good models of the mouth and he made an appliance which was inserted in one piece. That proved to be quite effective.

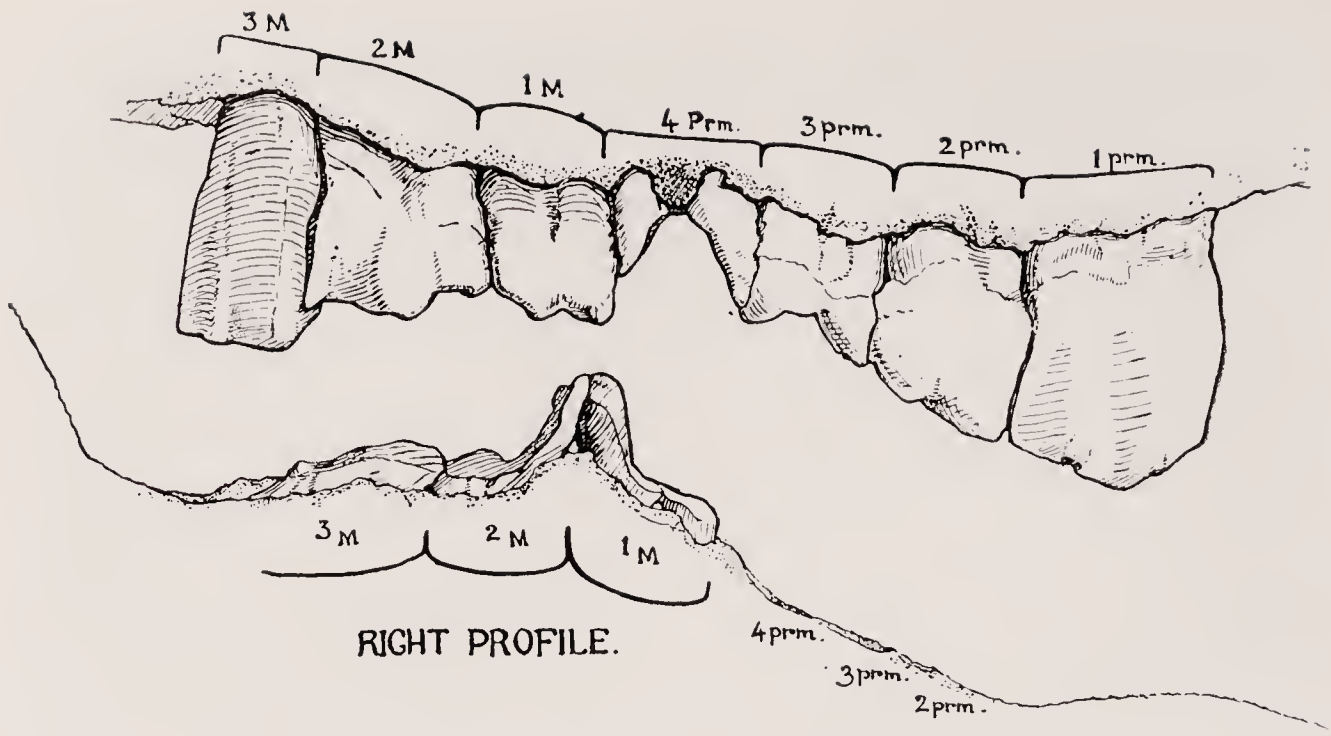

Fig. 7. Drawing right profile, teeth apart.

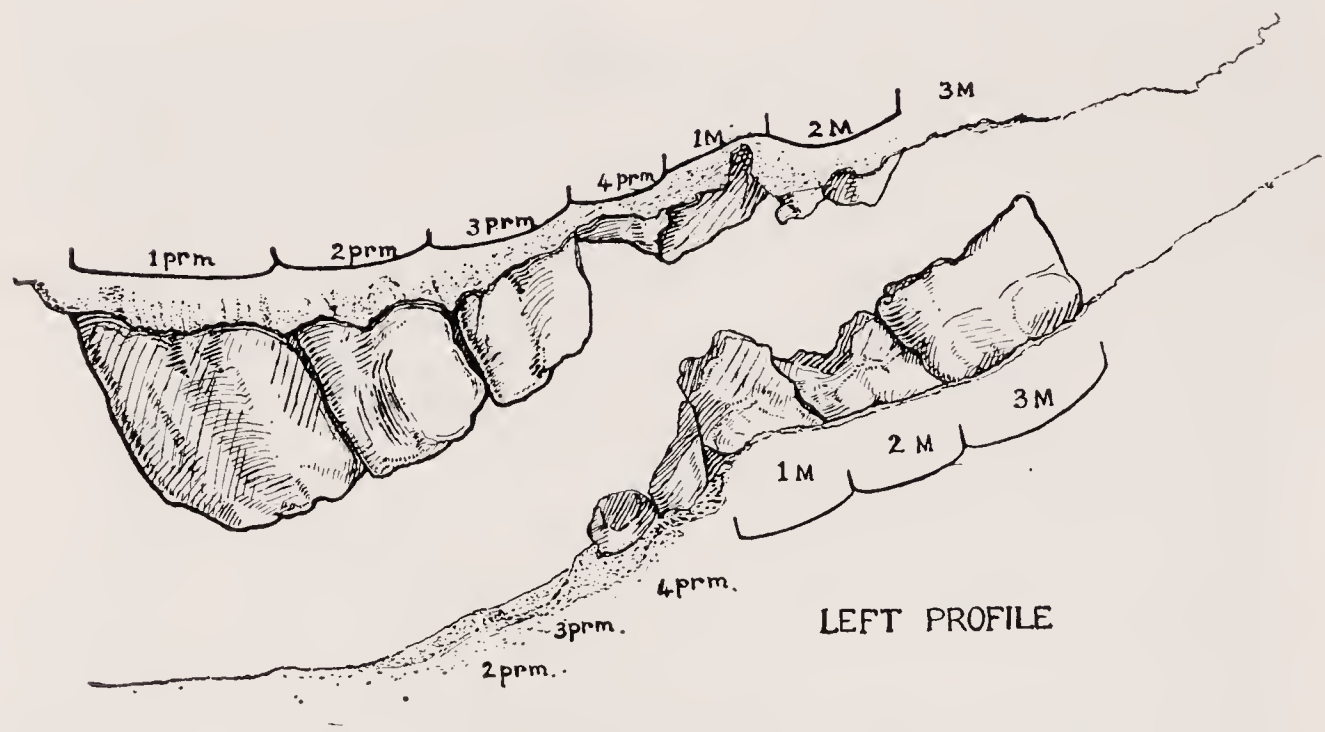

Fig. 8. Drawing left profile, teeth apart.

Mr. R. CUTLER said it would be interesting to know whether Dr. Friel had himself treated irregularities in dogs. The irregularities in the teeth of Pekinese and bulldogs and some other highly bred dogs were extraordinary, and the clinical condition in dogs seemed to vary a great deal. In the Pekinese the deposits of tartar and the amount of caries found were enormous, whereas the teeth of dogs that lived out of doors seemed to be quite perfect. He had never seen a cat's mouth that was not healthy.

Mr. F. St. J. STEADMAN, referring to Dr. Friel's statement that "My Prince" was bad tempered and would not allow a file to be used on its teeth, said it reminded him of a famous elephant that went mad after being shot in the tusk. It killed everybody that it came across. Might not the extreme pain which "My Prince" suffered account for its bad temper?

Dr. S. FRIEL, in replying to the discussion, said Mr. Visick had asked him whether he knew the cause of the condition. He had not been able to find out much. He had spoken to the veterinary surgeon who looked after the horse for a great number of years. He told him that the condition was always present, and that the horse was continually having digestive troubles and went completely off its food. It had to be given bicarbonate of soda and other treatment to get it back into health, but after a few weeks it started to be unwell again. With regard to Mr. Cutler's question as to whether he had ever treated dogs, he had two dogs, both with Class III malocclusion, and he kept them in that state so that he could show them to the parents of children who had that type of malocclusion. He did not think that " My Prince " ever had caries. Its teeth were perfectly polished and there was no sign of caries at all, nor was there any sign of exposure of the pulp chambers. The veterinary surgeon told him that some kind of gag was put into the horse's mouth to keep it open to which the horse did not object, but as soon as an attempt was made to file the teeth with a rasp the horse moved one of its front legs up and down, and that put an end to the attempt.

TISSUE CULTURE STUDIES IN TOOTH DEVELOPMENT*

By Miss S. Glasstone, L.D.S.Eng.

BEFORE dealing with the application of the tissue culture method to the development of teeth, I should like to say a few words about the method as a whole and its uses.

The tissue culture method is now a standard way of analysing the factors responsible for the development of embryonic tissues and embryonic organs. It has the advantage that these organs are isolated from the body and taken away from the general influence of the body, from the influence of the nerves and blood vessels, and from the adjacent surroundings. One is therefore able to watch the differentiation and growth of these tissues. By this means the development of the skeleton has been studied very carefully. The early rudiment of a limb has been explanted from the thigh, and, although it was at first just a mass of mesenchyme cells, those cells differentiated and eventually the whole limb was formed, there being a perfectly formed femur, tibia and fibula, and a well formed joint, in spite of the fact that it was removed from the body. If a chicken blastoderm is explanted at a very early stage, the primitive streak will form an embryo, and so the development of the embryo can be watched. Another use to which the tissue culture method can be put is to see the effect of irradiation on the degeneration and mitoses of normal cells and cancerous cells.

The tissue culture method is as follows. A piece of tissue, a mass of cells, or a particular organ, is removed from the body and is explanted into a new medium. The medium is usually a physiological saline solution, to which plasma is added, and a semi-solid clot is obtained in which is transplanted the tissue. As a rule, plasma from a fowl and chicken embryo extract is used. It seems rather extraordinary that explanted mammalian tissue should grow so well on plasma obtained from a fowl, but it does it equally as well as in its own plasma, and it is certainly easier to get the plasma from a fowl than to get it from a mammal. In addition, fowl plasma clots much more easily. The tissue is put into a clot of plasma and extract in a glass vessel and placed in an incubator for several days. One method which can be used is the watch glass method, in which the clot is made on a watch glass, which is then placed into a Petri dish with a layer of cottonwool and a little water in the bottom. This method is useful for large tissues. For small tissues the hanging drop method is used. In the latter method the clot with the tissue in it is put on a coverslip, which is then inverted over a hollow ground glass slide. The tissue is left in the clot for several days. It depends on the tissue how frequently the medium should be changed. Some tissues like to have a fresh medium every two days, because metabolism is taking place and metabolites are formed in the medium. Teeth like to be left undisturbed for several days. Sometimes I have left them for as long as six days. I tried changing the medium every

* Read before the Society, March, 7th 1938.

two days but they did not develop so well, so I left them for six days.

With regard to the size of the tissue, there is a limit to the size that can be used, because it gets its nourishment by diffusion from the medium into the cells, and if a very large piece of tissue is used the nutrient medium will not penetrate to the centre of the explant and so it degenerates. On the other hand, if the tissue is too small the cells will disintegrate and one gets a few isolated degenerate cells. Therefore it is necessary to be very careful to use just the right size.

That is a rough outline of the tissue culture method. The general features of tooth development have been worked out very well indeed, but not the details. It was thought that the tissue culture method would be a very suitable method for studying the minute development of the tooth germs, because they could be removed from the jaw and microscopic observations could be made during development. The first thing I did was to use early tooth germs from rats and rabbits. I took them at the stage when the tooth had its proper shape but there were no odontoblasts and no dentine.

A section of a rat incisor in the jaw is shown in Fig. 1. I think this tooth had some odontoblasts, but they were only just beginning to form. The shape is more or less determined. The incisor of the rat is convex on one side and concave on the other side.

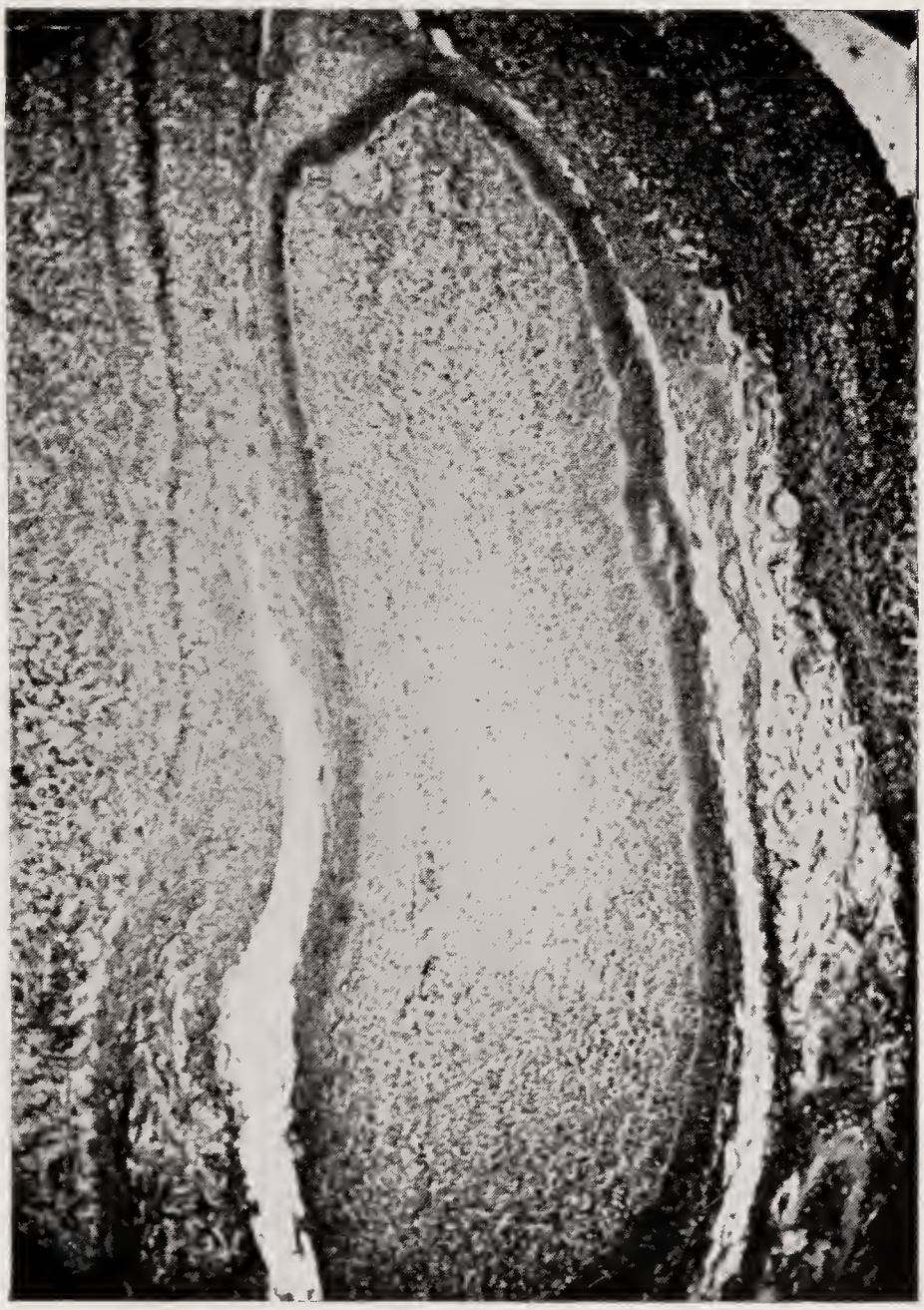

Fig. 1

Fig. 2

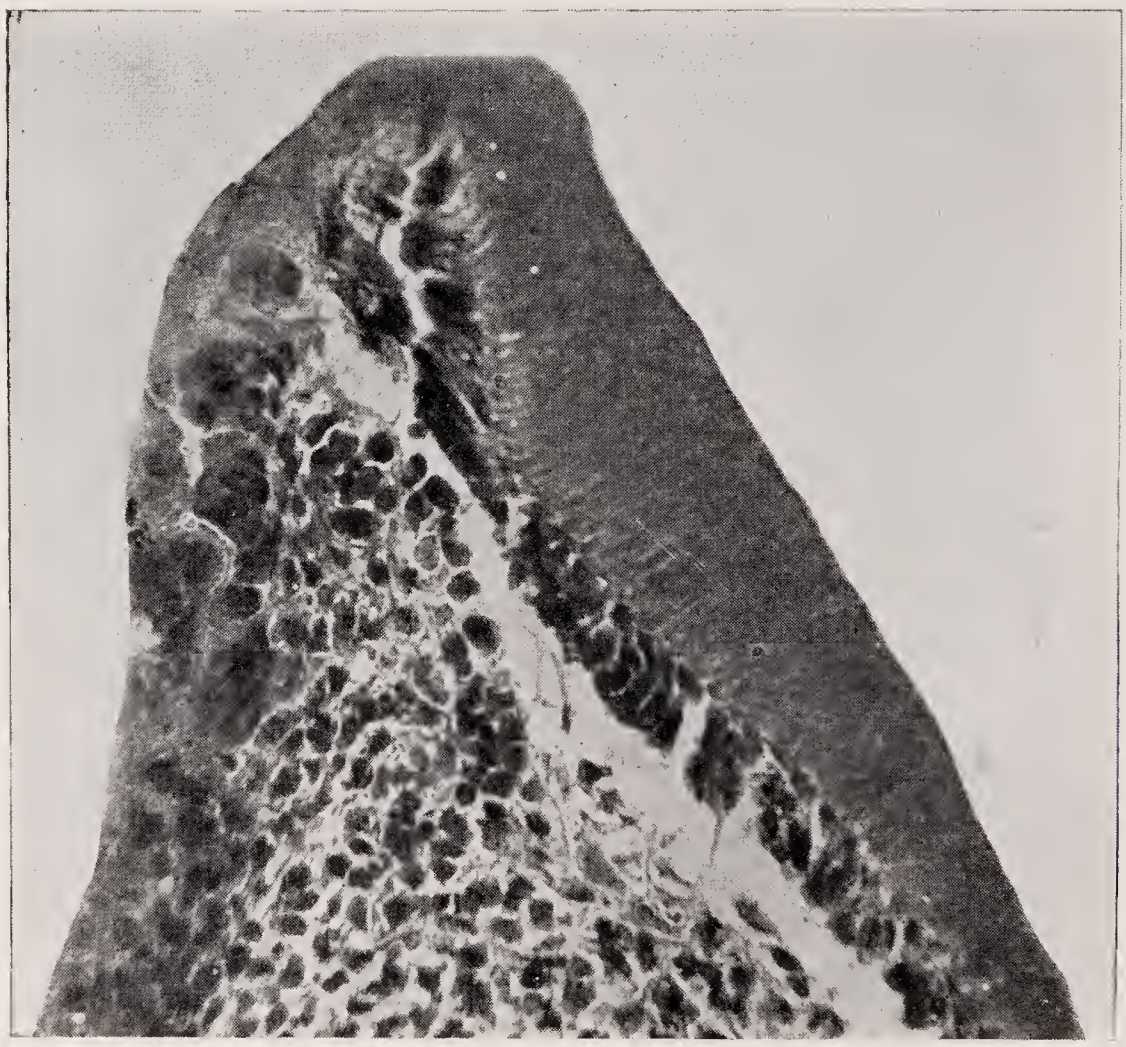

Fig. 3

Fig. 2 shows a similar tooth, but taken out of the other side of the jaw, after it had been in culture for eight days. Odontoblasts can be seen.

Fig. 3 is a section of the dentine showing the perfectly normal tubules that were formed, with the processes running right through from the odontoblasts. The tubules and odontoblasts are also seen in a transverse section of the dentine shown in Fig. 4.

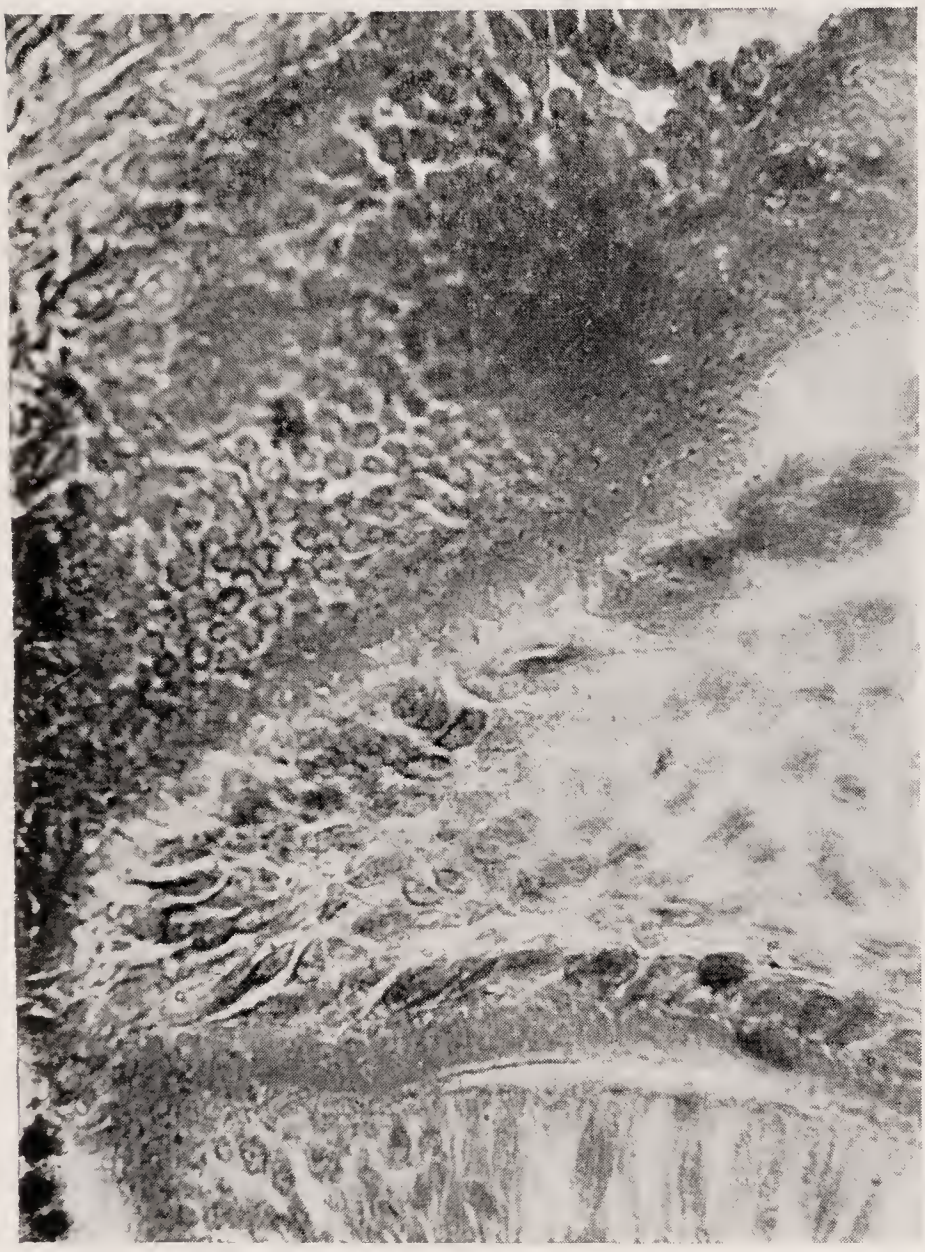

Fig. 4.

Fig. 5.

I thought the incisor of the rat being a tooth with persistent pulp, that if I stripped off the dentine of a tooth in which the dentine was already calcified, the tooth should go on forming new odontoblasts and new dentine. A dentine papilla which had a rather large cap of dentine stripped off it is illustrated in Fig. 5. Some odontoblasts were left, but most of them came off with the dentine. The ameloblast layer which was left, is seen, and I found that wherever it remained new odontoblasts formed, and they deposited dentine. The original odontoblasts that remained at the tip of the culture often degenerated, due to the fact that when the dentine was taken off, the processes were injured and probably the odontoblasts with them, but if they remained healthy they did form some dentine.

Fig. 6.

The section illustrated in Fig. 6 has been obtained from a culture transplanted into fresh medium every two days and is consequently contracted and of a rounded form. A band of dentine is forming in proximity to a layer of ameloblasts. Most of the odontoblasts have degenerated. This culture was grown for twenty-one days. There is a band of dentine shown which was formed by odontoblasts that remained on the tip of the tooth after I had removed the original cap of dentine. Wherever there is a layer of ameloblasts the dentine that is formed is formed in a regular sheet. When odontoblasts only are present they will form dentine but there is no control over its shape. It forms in irregular bands.

In a high-power photograph of a dentine papilla (Fig. 7) one can see the ameloblast layer which remained in the culture and the new odontoblasts that were formed.

The dentine that is formed is not always calcified. That again, I think, may be due to the fact that there is something lacking in the medium. When I took rabbit incisors which had just started calcification, as seen in Fig. 8, and explanted them for several days, I found that the calcification continued.

The cap of calcified dentine is very much larger in the culture illustrated in Fig. 9 which was put into fresh medium every two days. The cultures that were left in the medium for six days grew even larger.

After doing this work on the formation of dentine, I thought I would take earlier tooth germs, before the shape had been determined, and transplant them and see whether cusps would form

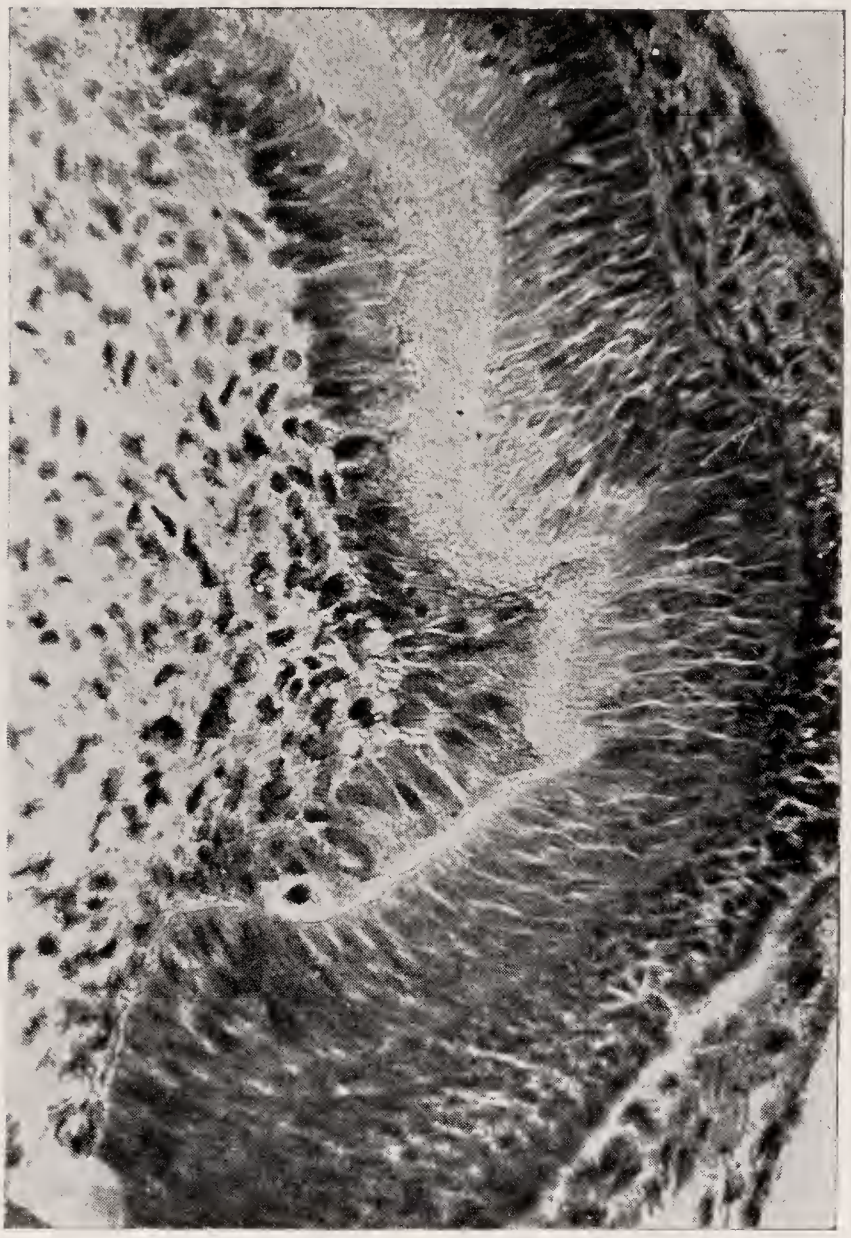

Fig. 7.

Fig. 8.

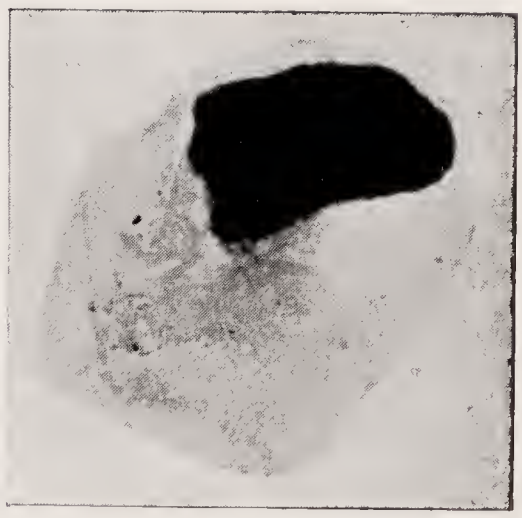

Fig. 9.

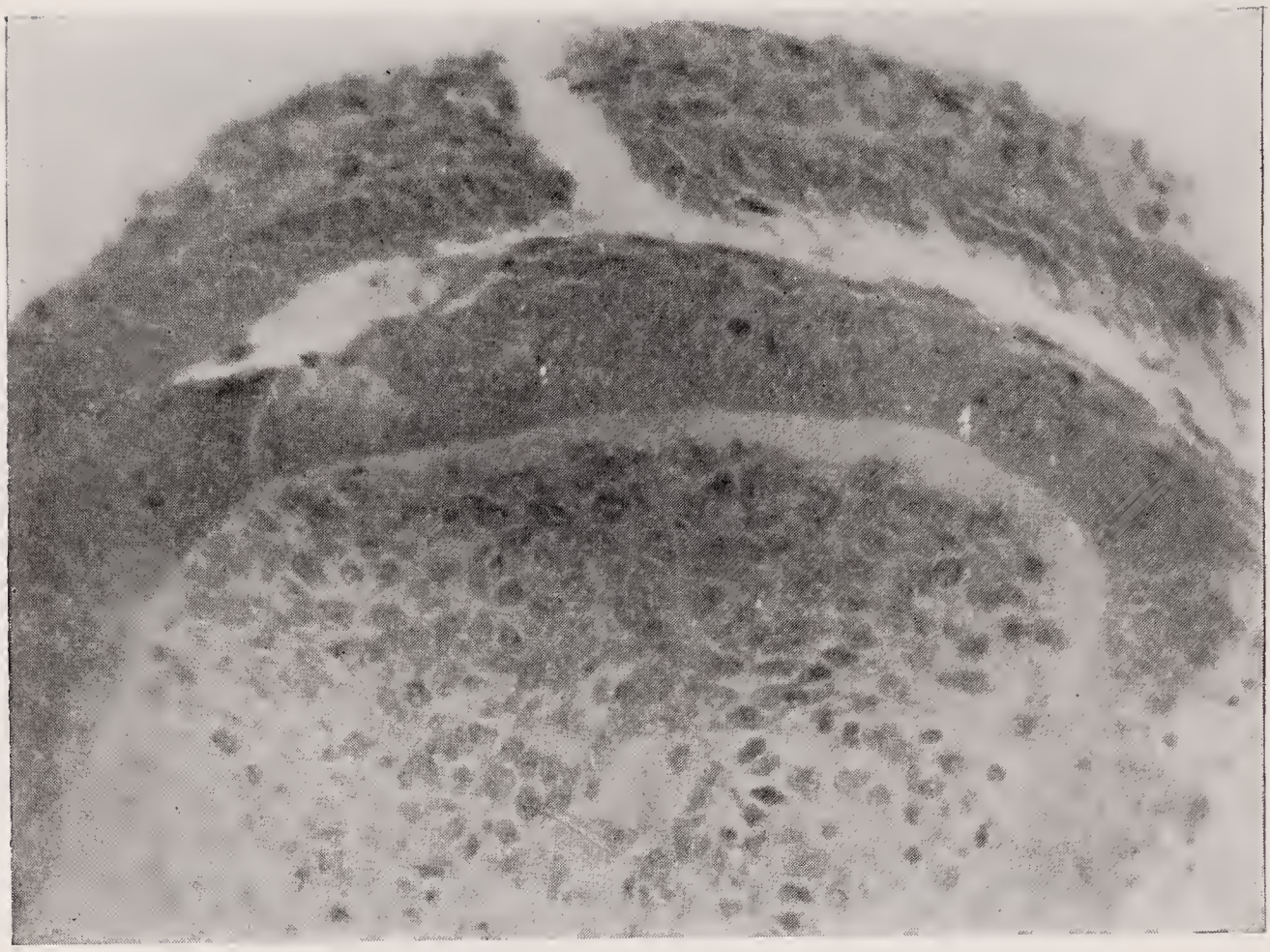

Fig. 10.

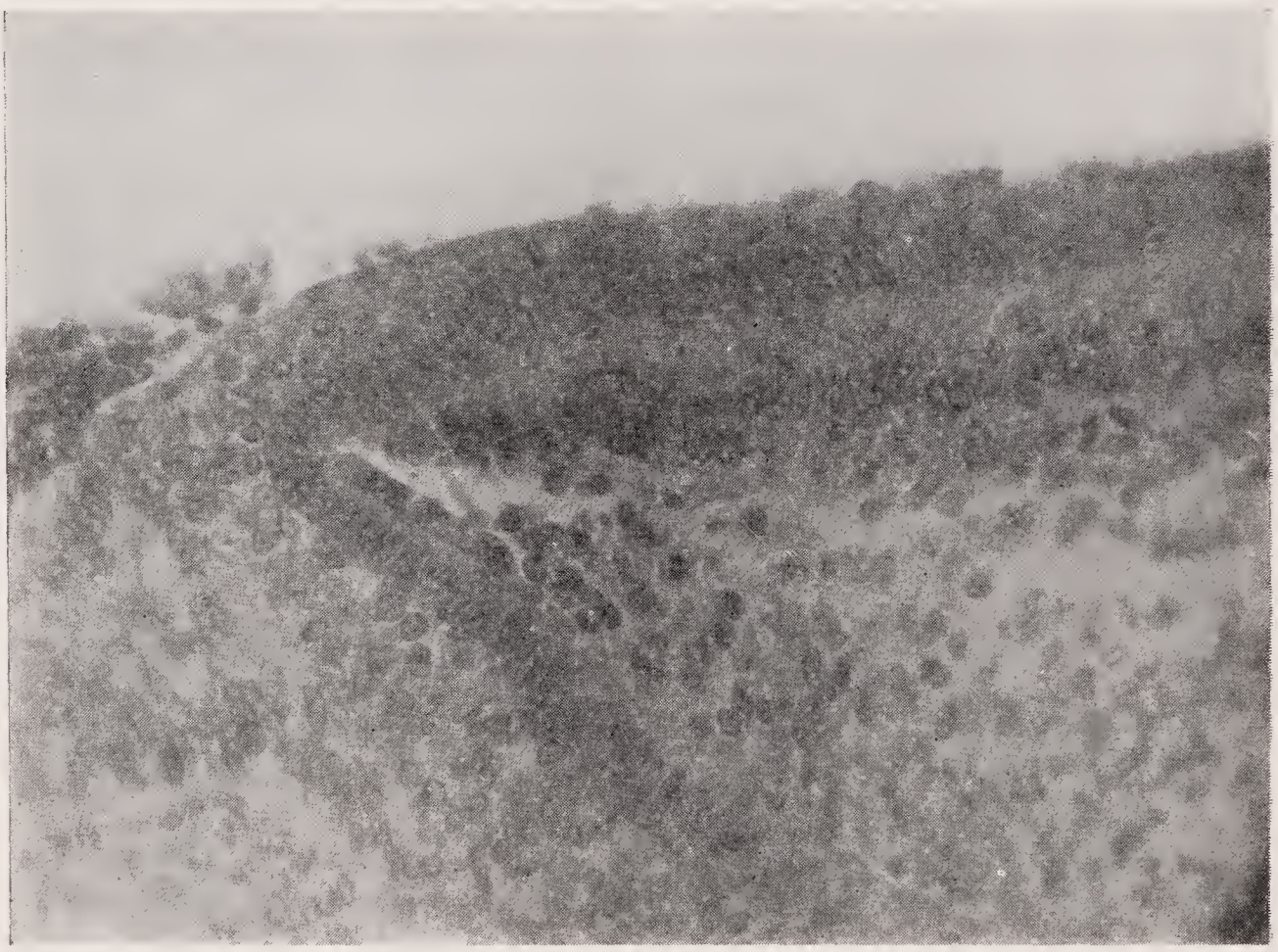

Fig. 11.

when the tooth was isolated from its surroundings. A control of a human tooth, about eighteen weeks old was shown in a coloured slide. The enamel organ and the dentine papilla were present, but there were no cusps. Another coloured slide was shown of a similar tooth which had been grown in culture, showing the cusps that had formed. These teeth have to be dissected with extremely aseptic precautions, because once a culture is infected there is no chance of it surviving. All the glassware and everything else that is used are sterilised, and the plasma is removed under the strictest aseptic conditions. I did the same thing with early incisor tooth germs. An incisor tooth germ transplanted when it is a bell-shaped germ will gradually elongate and take its proper shape (Fig. 10). It becomes very much pointed, with the convex side upwards and the concave side downwards (Fig. 11).

Rat and rabbit molar tooth germs taken just before the cusps appeared, formed cusps after they had been two days *in vitro*.

In the case of the rat, the number of cusps that form is identical with the number of cusps in the normal tooth ; the arrangement and shape are the same, but the tooth is very much smaller. In the case of the rabbit, an extra cusp is often formed, but I found that this extra cusp was practically the same in all the cultures, so there is a possibility that at one time the rabbit molar had more cusps than it has now. I found that some formed an extra cusp, whilst others had only the ordinary number of cusps.

Although these tooth germs were explanted at a very early stage, they formed cusps and they also formed odontoblasts and dentine. The ameloblasts became functional and started to form enamel. The amount of enamel was very small indeed. This is the first time I have been able to get enamel formed *in vitro*. I think I may get a thick layer of enamel later on, as I get of dentine. The reason for growing these molar tooth germs was to see why it is that the cusps form. I have discovered that the factors which are responsible for the formation of cusps are present in the enamel organ itself, because if the enamel organ is slightly injured during dissection the cusps that are formed are slightly abnormal ; they have little additional cusps on them ; whereas if it is not injured the normal number of cusps are formed.

Then I went into the histological conditions, to see whether there was some degeneration of the enamel epithelium as well as active mitoses of the dentine papilla, but I found there was not anything of the kind at all. The cells were dividing evenly all over the culture. Therefore I could not decide what was the cause of the epithelium dipping down to form irregular cusps. After that, I decided to cut these molar tooth germs in half and see how each half developed. This is not a very easy thing to do, for every time one tries to cut the germ it slips away, but I have managed to do some of them, and I believe that when they are cut in half each half forms a separate little molar. It was thought at first that each half would form its own particular cusps, but I believe that what really happens is that each half forms a little tooth ; I am not absolutely convinced of that yet, because I have to carry out a few more experiments first, but if my belief is right it will shed some light on the fact that

there are such things as supernumerary teeth. It is possible that in the early stages the tooth germ divides and forms two teeth instead of one.

Miss Glasstone then showed a film illustrating the development of teeth by the tissue culture method. She explained that the light necessary to the taking of the film seemed to have some adverse effect upon the growth of the tissues. The film emulsion was sensitised to infra-red rays. The action as seen was speeded up 2,280 times.

With regard to the variation in the rate of growth, in the normal tooth there was a very thick layer of dentine formed in one day, and therefore one would expect a comparatively thick band to be formed in a day in the culture. The rate of growth was not nearly as fast as in the normal tooth, of course, but still it was very fast. One could not compare the development of the rat tooth with that of the human tooth, because in the case of the human tooth the rate of development was very much slower. She used an embryo which was about nineteen days old, for instance, and if she used one a couple of hours later she found a considerable difference in the development. There might be a considerable layer of dentine formed even in a few hours. If that was the case in the normal tooth one would expect to get some dentine formed in a day in the culture, and, in the case of the dentine papilla, in three days a considerable layer of dentine was formed, The actual growth was not as rapid as one saw it on the film.

In the normal rabbit molar it was six days before the cusps were fully developed, and in the culture the time taken was very little longer ; it might be half a day or a day. Therefore one would expect the development to be slower in the cusp formation than in the dentine formation.

Discussion

Professor C. M. West, who opened the discussion, expressed his great pleasure at being present again at a meeting of the B.S.S.O. He congratulated Miss Glasstone on her communication and on the film that she had shown to the Society. He said that several points of interest arose out of Miss Glasstone's paper. First were her remarks on the reaction of the cultures to light ; Miss Glasstone had said that the cultures seemed to resent the exposure to light necessary in taking the photographs ; the speaker said that it made him wonder what action light had on the whole period of culture, for in making the cultures and in examining them under the microscope no special precautions were taken for the exclusion of light, though while the actual cultivation was going on the cultures were, of course, in the dark in an incubator. With regard to the cultivation of tissues *in vitro* ; while it was wonderful to be able to see tissues grow, it was not the actual growth that was so extraordinary but rather the fact that any given tissue should grow into the particular tissue that it did. Why, for example, did certain cells grow into odontoblasts, and why did they in turn give rise to dentine, why did they not form enamel or some other tissue ? What was the regulating mechanism which caused certain cells to form certain structures ? Such questions led on to the whole problem of growth organisers. Professor West said that he wondered how the absence of the secretions of the various ductless glands affected

the growth of the cultures ; Miss Glasstone had said that there was a tendency for the cultures to cease growing after a time, even though the medium in which they were growing was frequently changed ; what was it that was missing from the medium that caused cessation of growth ? Professor West concluded by asking Miss Glasstone for an explanation of some of the photographs and of parts of the film which were not clear to him and which he felt might be difficult of interpretation to some members of the audience who were not familiar with the technique of tissue culture *in vitro*.

Mr. K. C. Richardson, M.Sc., said he would like to congratulate Miss Glasstone on her excellent technique and the photography associated with it. He was acquainted in some small measure with tissue culture technique, and he thought that Miss Glasstone had not done herself justice in one respect, i.e. she had not explained the extraordinary amount of trouble and care which was necessary if successful cultures were to be produced. The method of tissue culture was not a new one, being over twenty-five years old. It had developed rather slowly because the work required a great deal of time and care, and even now the technique depended very largely on empirical factors. The tissue culture medium, derived as it was from the plasma of adult animals and from the juices of embryos, was of very variable composition. There were many other factors which made it quite impossible to standardise the technique as accurately as one would like to do in order to perform various experiments. Therefore, in starting to cultivate a tissue (and most tissues in the body had been cultivated now) one had first of all to carry out a large series of preliminary experiments to find suitable media and conditions of cultivation. Miss Glasstone had done that very successfully. When one took an organ out of an embryo and planted it in a tissue culture medium, further differentiation of its component tissues was not always obtained, but, as Miss Glasstone had said, in the case of tissues belonging to the skeleton, i.e. bone and cartilage, and in the case of tooth germs and in some other instances, explantation *in vitro* had yielded most valuable results. He thought that Miss Glasstone was to be congratulated on having been the first to realise that it was very likely that tooth germs would grow and differentiate *in vitro* in view of the very successful experiments which had been carried out on the development of bone *in vitro* in the Strangeways Laboratory. The method had certain limitations, inasmuch as one could not maintain the culture of a tooth germ for an indefinite period. Parts of it were apt to undergo necrosis, and it was only with small fragments of tissue that one could keep cultures going for a number of years. He would like to ask Miss Glasstone what she proposed to do later on with regard to further experiments on tooth germs. Did she propose to use any of the other methods of culture, such as explanting tooth germs into tubes containing a fluid medium, the fluid circulating over the wall of the tube, which was placed in a rotating drum ? Such a technique had been developed in America recently and was proving very successful for certain types of work. A number of explants could be put into a glass tube containing a fluid medium. The constant circulation of the fluid medium might assist in prolonging the life of the tooth germ beyond the limits that Miss Glasstone had obtained with the ordinary hanging drop technique. In 1935 Willis, working at the Royal College of Surgeons, showed that it was possible to grow tooth germs in the cerebral hemispheres of adult rats. He bored a hole through the skull and introduced a tooth germ with a lumbar puncture needle into a cerebral hemisphere. There the tooth germ became vascularised and there was not a great deal of derangement of the surrounding

nervous tissue. The development of dentine and a relatively normal embryonic tooth was obtained. Would it be possible to grow a tooth germ for a short period in the tissue culture medium and then prolong its life by introducing it into the brain of a rat, so that it might become vascularised and continue to develop ?

Miss GLASSTONE said that the tube method to which Mr. Richardson had referred was being installed at the Strangeways Laboratory. She had tried it once, but all her cultures had been infected. The apparatus had not been properly installed yet, but when that had been done she intended to use the tube method, because, as Mr. Richardson had said, it was a method whereby the life of the tooth germ could be prolonged and it would probably grow to a greater size. She had already grafted some tooth germs into the kidney of the rat ; they grew very successfully, and both dentine and enamel formed. Her object in doing that had been to see how tooth germs developed when grafted into normal animals, and her idea had been to graft tooth germs after that into deficient animals, to see whether the deficiency in the host animal had any effect on the development of the tooth germs. When she had first started the tissue culture method her final object had been to grow tooth germs in different nutrient media, and that was what she was eventually going to do, in order to see whether they developed normally or not.

Mr. R. CUTLER asked Miss Glasstone whether her cine-camera was connected direct to the microscope and artificial light applied to a condenser on the other side of the slide.

Miss GLASSTONE said the cultures were put into an incubator in the dark. The microscope was fitted up with transmitted light and it was put into a hot box, above which was the camera. There was some automatic gearing and shuttering which turned on the film every three minutes, and there was also automatic gearing which turned the light on automatically. One could get the light on for various periods—one, two or three seconds, according to the length of the exposure—and one could vary the time of the exposure every one, two or three minutes.

Mr. WILSON CHARLES said he had enjoyed the paper very much and wished to congratulate Miss Glasstone upon it. He was interested in the tissue culture method in connection with the eruption of teeth, because it seemed to him to hold out great possibilities. Professor Nicholson had asked him two or three times the same question as Professor West had asked that evening, i.e. as to what was the mechanical method by which the teeth actually came. It was known that they had an inherent tendency to form, but what was the exact method by which they formed ? He had been working at that problem for some little time, and he thought the tissue culture method held out some hopes of it being possible to tackle the problem successfully.

Miss GLASSTONE said she did not know whether it was possible to tackle the question of the eruption of teeth, but work was now being done on a method of diffusing the embryonic tissues and so giving them an artificial respiration and an artificial blood supply, so it might be possible to grow them very much larger and do something with regard to the eruption of teeth.

The PRESIDENT said that it used to be stated that nerves dominated nutrition. How did the tooth germ *in vitro* get that dominance when it was cut off from the nerve supply ? Were there the right materials in the plasma to supply the nutrition ?

Miss GLASSTONE said she did not think so. There came a time when the cultures would not grow any larger and would not differentiate any more, and probably the reason was that there was no nerve supply. There was a limit beyond which they would not go unless there was a

blood supply and a nerve supply. Therefore a nerve supply was essential in the later stages though it was not essential in the earlier stages.

Mr. M. A. Rushton asked whether the tissue culture method was applicable not only to tiny tooth germs but also to small pieces of larger tooth germs. One of the most important things that Miss Glasstone had proved was that dental epithelium was necessary for the differentiation of odontoblasts. That had been a question of debate for the last fifty years or so. He wondered whether dental epithelium was not also necessary for the differentiation of cementoblasts. Cementum was found only where dental epithelium had been, and when one found a little island of cementum in the periodontal membrane it was nearly always in the immediate neighbourhood of epithelial rests, as Gottlieb had first demonstrated.

Miss Glasstone said that she had grown portions of teeth provided that epithelium and dental pulp were present. With regard to the larger tooth germs, the great difficulty was their not being aseptic. Anything taken out of the mouth was almost certain to be infected, but if one could get rid of the infection she did not see why larger tooth germs should not be grown. Up to now she had used only embryonic tissues, but she was going to try to get material from post-natal animals and wash it very well and see whether she could get rid of the infection in that way. If that difficulty could be overcome, there would be great possibilities of growing adult tissues.

Mr. H. Chapman said he was not quite clear whether, if the odontoblasts were once removed, further odontoblasts could be formed which would continue to lay down dentine.

Miss Glasstone said that if the original odontoblasts were removed no odontoblasts would form unless there was some enamel epithelium present. An epithelium layer was essential for the purpose ; it acted as an organiser on the dentine papilla to form the odontoblass. She hoped some day to carry out an experiment by cutting off a piece of enamel epithelium and wrapping it round a piece of dentine papilla which had had the odontoblasts removed, and then see whether it induced odontoblast formation.

Miss K. C. Smyth said that possibly Miss Glasstone might not be aware that one of the members of the staff of the Royal Dental Hospital had recently been performing a number of operations for the removal of the third lower molar germs at a very early stage, before calcification took place. She did not know whether Miss Glasstone might find that a useful source of supply of the material that she required.

Miss Glasstone said the germs probably became infected, but if they were aseptic they would be of great use.

Miss Smyth said she knew that very special precautions were taken in the removal of the germs.

Mr. H. G. Watkin said he would like to thank Miss Glasstone for her excellent paper. There was one question that he wished to ask in connection with the technique, i.e. what special precautions did Miss Glasstone take to keep the heat rays out when she was photographing ?

Miss Glasstone said the light could not be kept out, and that was one of the reasons why infra-red light was used, but long exposures even with that light affected the cultures. Many cultures were wasted, and that was definitely due to the light ; she had had to go on wasting cultures until she got one that stood up to the light. When she had sectioned that she had found a little band of dentine, but if it had not been exposed to so much light she was sure that very much more dentine would have formed.

Mr. H. G. Watkin said he thought it was heat rather than light that mattered.

Miss GLASSTONE said the heat was fairly constant in the incubator. There were thermometers on the incubator and right on top of the culture vessel, registering the temperature; it was slightly variable, but that did not make a great deal of difference.

Mr. WM. HEADRIDGE said that in a recent article he had read of research work in America similar to that which Miss Glasstone had carried out. The nucleus had been removed from the male and female cells in the embryonic growth, and growth went on normally without the nucleus. Had Miss Glasstone done any work on odontoblast cells without the nucleus, and, if so, did they still go on forming dentine?

Miss GLASSTONE said she had not done such work. She thought the germ cell was larger than the odontoblast cell, and it was not easy to get hold of the nucleus of the odontoblast cell. Some such work had been done at the Strangeways Laboratory on cells which were isolated, i.e. fibroblasts. It was much more easy to carry out the experiment on them than on a number of odontoblasts all in one line.

Mr. K. C. RICHARDSON said that for a long time tissue culture workers had attempted to make a culture starting with one individual cell—taking a small piece of tissue and isolating one cell—but there had never been any success in that direction. It was thought that the slightest injury to an individual cell was sufficient to kill it, and, of course, in separating a cell one was bound to injure the cell membrane. He thought that cutting the nucleus out must inevitably kill a small cell like an odontoblast.

The PRESIDENT said the members had had a most delightful and interesting evening. She proposed a very hearty vote of thanks to Miss Glasstone, for her kindness in coming from Cambridge and presenting such an excellent paper, to Professor West, who had come from Cardiff to open the discussion, and to Mr. Richardson and all the other speakers who had taken part in the discussion.

The vote of thanks was accorded by acclamation and the meeting then terminated.

*DEMONSTRATION: THE ACQUIRED FORWARD MOVEMENT OF THE MANDIBLE AS THE RESULT OF THE EARLY REMOVAL OF THE DECIDUOUS MOLARS.

By W. A. Sowden Hills, L.D.S.Eng.

MODELS and illustrations were shown of a condition found in young children who had had their deciduous molars removed before the eruption of the first permanent molars. The cases had been collected in the public health dental service.

The extractions in many cases resulted in a mandibular protrusion and excessive incisor overlap. The articulation of the deciduous canines was of such a character that the mandible could move forwards and upwards as was shown by the sliding contacts of the upper and lower canines. This movement was induced because the child was uncomfortable in a normal canine occlusion. If the child attempted to retrude the mandible into a normal position then the deciduous canines occluded tip to tip. Examination of the upper models showed that the deciduous canines moved lingually and at times distally. In some cases the mandible moved laterally so that a cross occlusion resulted.

It was shown that a prenormal occlusion could be produced where only the lower deciduous first molars had been removed and, in this case, as the upper deciduous canines were unable to move distally owing to the presence of the first deciduous molars the mandible moved forward, but without a marked incisor overlap.

Where the first deciduous molars had all been removed permitting the distal movement of the upper canines the condition appeared to be prenormal, but it was only a pseudo-prenormal occlusion as there was no forward movement of the mandible.

Where these cases were uncomplicated by the presence of the permanent teeth in an abnormal position, within their own arches (which was very likely to occur in that the permanent upper incisor teeth tended to erupt lingually to the lowers) the application of a simple bite-block to free the contact of the deciduous canines was sufficient to overcome the trouble, and the first permanent molars as a result of the wearing of the appliance would then erupt further and keep the incisors from overlapping excessively.

Complicated cases necessarily required individual orthodontic treatment. Removal of the deciduous canines as a form of treatment was deprecated as, for one reason, it did not overcome the increased incisor overlap.

*Given before the Society, May 2nd, 1938.

*DEMONSTRATION: A DEVELOPMENT OF THE SKELETAL BAND.

By Mr. L. M. Markham, L.D.S.Eng.

THE Skeletal Band. Opposed cone-surfaces can be seen on the crown of every human tooth. The skeletal band grips equally the cone-surfaces and the inverted cone-surfaces of the crown for which it has been made, securing a firm grip, and always seating itself in the same position. The band is made of a loop of springy, round, gold wire running close to, and parallel with the occlusal surface; the loop is interrupted across one approximal contact line; spurs of the same round wire (thinner) are soldered to the loop, at right angles to it, four spurs, parallel with the long axis of the tooth, extending in each approximal space towards the gingival margin, just within the rounded corner where the approximal becomes the buccal or lingual wall. After soldering, the spurs are bent to correspond with the slope of the (approximal) inverted cone-surfaces of the crown. While the completed band is being pressed home on the crown, the loop will be seen to open, then to close, gripping the crown firmly. Flexibility is necessary.

The Multiple Skeletal Band. This is designed to secure an anchorage upon a group of adjacent teeth. Instead of a loop, a continuous ring is used, contacting closely with all the cone-surfaces of the teeth of the group, passing above the contact line at each end of the banded group where two spurs are soldered in positions corresponding with the single skeletal band. A single spur is soldered to the ring opposite each end of each contact line existing within the group. A ring for a group of three crowns would possess eight spurs, two at each "end," two at each "side." The end spurs are bent as described for single band. The side spurs may be bent under the contact point if accessible, or, against one of the inverted cone-surfaces adjacent to the spur. In this multiple band the necessary *flexibility* is provided by the length of the "sides" of the "ring," by using (for the ring) a thin very tough and elastic round wire of the smallest gauge found practical; also, *torsion* of the wire forming the "sides" of the ring occurs on placing and removing band.

In examples shown, multiple bands have rings of Ash's Ortho F wire (round), a white gold, of gauge 19 (American); spurs of gauge 18, round, 17ct. platinised gold wire which has been found softer than enamel during many years. Skeletal band, open loop is 17ct. round wire of gauge 16, spurs of same wire of gauge 18.

*Given before the Society, May 2nd, 1938.

*DEMONSTRATION: MODIFIED CALE-MATTHEWS BAND FORMING PLIERS.

By Hubert C. Visick, L.D.S.Eng.

WITH the Cale-Matthews pliers a loop of stainless steel is slipped over the tooth and pulled tight by pressure on the handles. In this way a very exact measurement of the tooth is obtained with the band material itself. The modification consists in an added catch which secures the loop of stainless steel to the beaks of the pliers, and gives one complete control while adapting it to the tooth.

*Given before the Society, May 2nd, 1938.

*DEMONSTRATION: THE CORRECTION OF ARCH RELATIONSHIP

R. Ernest Rix, M.R.C.S., L.R.C.P., L.D.S.Eng.

MODELS were shown demonstrating points of interest in the treatment of abnormal antero-posterior arch relationship.

In cases of postnormal occlusion the point was made that providing the excessive incisor overlap was decreased with a removable appliance in the initial stages, the subsequent treatment with intermaxillary traction apparatus was shortened. It was often possible if the bite were thus raised to bring about normal arch relationship by employing elastic bands at nights only, a considerable concession to the convenience of the patient and one that lessens the vulnerability of the apparatus. Following upon treatment with fixed apparatus the lower dental arch could not be placed in the original position of postnormality.

One contrasting case was shown where the bite had been "jumped" with removable apparatus. It was a rare example of success obtained without the use of fixed intermaxillary traction apparatus. The treatment had lasted as long again, and it was still possible, though uncomfortable, for the patient to bite back in postnormal occlusion. The lower arch however now habitually occluded in the normal position. To date this condition had remained unaltered for four years without appliances.

A case of prenormal occlusion was shown where treatment was fortunately started before the permanent upper and lower incisors had erupted sufficiently to establish an incorrect overlap. The pre-normality had been induced by the early loss of deciduous molars. By inserting vulcanite bite blocks to open the bite, and to remove the mandible from the influence of the deflecting cusps of the upper and lower deciduous canine teeth, the lower dental arch assumed a normal relation to the upper, and the upper and lower incisors finally erupted into correct position.

*Given before the Society, May, 1938.

THE WORK OF THE ORTHODONTIC DEPARTMENT OF THE EASTMAN DENTAL CLINIC*

By C. L. Endicott, L.D.S.Eng.

IN this outline of the work of the orthodontic department of the Eastman Dental Clinic it will be my endeavour to give you an idea of how the department is conducted, and I hope this may prove of some interest. I shall at the same time deal with some of the reasons from an orthodontic point of view on which the routine has been developed, and afterwards I propose to show a number of slides of cases treated with or without appliances.

Including the three part-time honoraries there are thirty-seven dental surgeons in all on the Clinic staff. Thirty of this number are recently qualified people appointed to temporary posts. The full-time permanent staff consists of four members. Three of the four members of the permanent staff share in the supervision of the orthodontic department. The director and the chief-of-staff each apply as much time to this department as the general work of the Clinic permits, and an assistant chief-of-staff devotes full time to supervising orthodontic treatment. Under the instruction and guidance of these officers eight recently qualified dental surgeons carry out the treatment for all patients wearing appliances. Their duties are limited to orthodontics. These post-graduate appointments are for full-time for a period of not less than six months. They provide a wide knowledge of orthodontic technique together with a foundation on which to build the comprehensive understanding of orthodontics which results only from years of experience, observation and study. Although six months is inadequate for obtaining the experience required to specialise, it is sufficient for gaining much valuable knowledge, not the least important of which is that enabling an intelligent forecast of the probability of the

*Read before the Society, Nov. 7th, 1938.

success of treatment. Many an ambitious young dental surgeon with a very limited knowledge of occlusion and malocclusion has unwittingly selected for his first orthodontic case (usually at a very small fee) one of the type which was destined from the outset to meet with failure. The result is that too often this drives him to the firm resolution to have done with orthodontics for ever; an unfortunate decision which could have been avoided by some knowledge of which cases can be undertaken with every hope of success and which cases should only be attempted after a clear understanding has been given that no promise can be made except a promise to do one's best. I think all will agree that such cases exist. While six months is the minimum for which members of the staff are appointed, a number have remained for the recommended period of a year or longer. Vacancies are generally filled by selection from among the members of the staff of the treatment room who express a desire to proceed to this department. Experience in the general work of the Clinic as a preliminary requirement has been waived on three occasions during the past eighteen months, when well recommended candidates have sought appointment directly to the department.

During the final month of an operator's appointment he works along with his successor, who in turn is devoting his first month to the work of this department. In the course of this transfer period it is endeavoured to have each case attend twice, so that the new operator may become conversant with the case and the treatment which is being undertaken. During the succeeding four or six weeks the director or the chief-of-staff assists with diagnosis and the plan of treatment for each new case. Following this introductory period the new member is required to write his or her own diagnosis and plan of treatment for each new case and this is then confirmed or modified by a member of the permanent staff. Each member of the staff is free to consult one of the heads at any time and cases are checked at irregular intervals. The members of the temporary staff frequently discuss problems with one another. The more difficult or complicated cases however are not left in the hands of the new operator but are transferred to a more experienced member of the staff. Although each case remains in the hands of one operator so long as he, or she, is on the staff, patients seldom are under the care of one operator only throughout their treatment. This is a disadvantage, the result of which is that our cases make slower progress than they would naturally if in the hands of one experienced operator throughout the period of treatment. To offset this disadvantage members of the permanent staff endeavour between them to have a knowledge of all cases. Together with the 75 to 90 appliance cases under his or her care, each operator has the opportunity of following the more interesting of the cases which are being treated by colleagues. Each is also allotted an equal share of cases treated only by extraction and kept subsequently under periodic observation, as well as a certain number of pre-treatment observation cases. Thus experience with all phases of orthodontics is provided. Further reference will be made to each of these groups of patients.

The staff also includes a dental attendant, whose duties are chiefly to assist with records and filing. Two junior mechanics carry out the majority of the plaster work on models, and similar tasks, as well as doing the vulcanising and polishing of all plates, after the appliance has been designed and constructed by the operator up to the vulcanising stage. The range of appliances used includes a few removable appliances, and encouragement is given to those keen to try various types, with the exception of the rigid appliances such as the ribbon arch. The popular stainless steel lingual arch, a modification of the Marshon arch, predominates, and labial arches including the high labial are used frequently. Tooth movement is carried out principally by means of the various popular auxiliary finger springs, which are used generally with fixed appliances because of the greater measure of control and protection afforded by a fixed arch. I am, nevertheless, aware that many excellent results are obtained through the use of finger springs with removable appliances and the development of designs whereby the free ends of springs are eliminated has proved a great advantage when they are used with either fixed or removable appliances.

Stainless steel is the metal of choice, not only for economic reasons, but also because of the efficient forces which this admirable wire exerts. Welding or soldering is used for making joints and while personally I prefer welded joints, most members of the department show a preference for soldering, except for bands. The technique of welding requires considerable practise and cannot be considered as automatic as its strongest advocates make it appear during a demonstration, whereas soldering seems more readily mastered. A limited number of precious metal appliances are employed in special cases, which enables members of the staff to familiarise themselves with the technique of soldering precious metals—a technique quite different in detail to that used for stainless steel. With the former the minimum of solder is the ideal, whereas with steel sufficient solder to envelop the joint is required.

In the treatment of cases of deep over-bite a few incisal bite planes are used in connection with the fixed type of lingual arch. Generally in these cases however, a bite plate is used (almost always with an anterior inclined plane of vulcanite) and usually in the early or late stages of the treatment. The Badcock expansion plate seems particularly indicated in cases where the buccal teeth of one or both sides of the upper arch are lingual to their normal relationship with the teeth of the opposing arch. Retaining plates, especially of the Hawley design, are favoured after the completion of active treatment, particularly where an arch has been expanded. In general they are worn continuously for at least six months, and at night only from then on for as long as the co-operation of the patient can be obtained.

The greatest single problem which we face is that of dealing adequately with the very large number of cases applying for and requiring treatment. This, I gather, is a common experience in all hospitals and clinics. Facilities for orthodontic treatment for

the lower income groups are required on a much greater scale than exist at present. As a result, cases have been referred from a very wide area and it is difficult to find a satisfactory method of dealing with all of them. Steady growth in the demand for treatment necessitated a recent decision to accept new patients from the County of London only in future. However, despite these and the difficulties presented by the problem at large, I do not find myself in agreement with those who maintain that no solution can be found for dealing with the problem of malocclusion in the school dental service. I am hopeful that in time a reasonably satisfactory solution will be reached, which will be practicable in many localities. Every existing scheme is contributing towards the solution primarily or secondarily. It is likely that any system which eventually becomes general will retain as a characteristic a method of selecting for treatment the most suitable cases up to the number with which it is possible to deal. Such a selection is possible from the point of view of the individual and the extent and nature of the malocclusion present.

New cases, after being inspected in the examination room where all other dental treatment required has been charted and discussed with the parent, are then referred to the orthodontic department. There the malocclusion is charted by the assistant chief of staff. The Angle classification is used as a basis and all details of the condition are recorded together with any relevant history. When this data has been collected, the case is next examined by me or by the chief of staff, and is then either referred to the waiting list for treatment subsequently with appliances, or dealt with by any possible alternative which may seem indicated. The number of cases that can be treated with appliances is necessarily restricted, especially in the hands of operators whose experience is somewhat limited, and detailed reference will be made to this group later.

It is probably preferable in public health or hospital treatment to avoid or minimise the use of appliances if a satisfactory improvement can be obtained otherwise. When the complete co-operation of the patient seems doubtful and judicious extractions alone seem likely to bring about an improvement, this is the method chosen. It is a method the results of which are too frequently of doubtful benefit, although many cases show excellent results. The most careful and thorough consideration is given each case before sound teeth are sacrificed. Study casts are obtained as a record of the original condition and usually a series of six X-ray films is taken to help in ascertaining the root alignment and relationship. The decision as to which teeth should be extracted and the correct time for extraction is made with the greatest possible care. Frequent reference to other cases is helpful, but each case is necessarily treated on its merits and as an individual case. These cases are allocated to members of the staff in rota. The operator obtains the necessary record casts and X-rays and forms a decision. (Records of this nature are essential for comparison at a later date.) The operator then confers with a member of the permanent staff and obtains verification or modification of his or her decision. In cases in which it is difficult to reach a conclusion, ideas are

invited from several members of the staff, giving rise frequently to valuable discussions.

Following extractions, these cases are recalled for observation at intervals of six months. Further record casts are obtained at intervals of twelve months. In the event of the unsatisfactory progress of a case, treatment with appliances is considered and instituted ultimately in a certain number of these cases. A valuable collection of records of tooth movement following extraction has been gathered as a result of this routine. May I again emphasise the importance of obtaining record casts of any and every orthodontic case at the outset and preserving these records carefully. I feel this policy is highly valuable and well worthy of repetition. Records including casts should be obtained of every potential orthodontic case at the earliest possible opportunity. For the purpose of comparison they can be of the very greatest value later in assessing a case, when the age for undertaking treatment has been reached. Also they may prove of great assistance in making a decision, which I find frequently most difficult ; namely that of whether or not extractions are indicated, and if so, whether they alone will prove adequate.

In a science such as orthodontics which is so far from being exact, our ideas and ideals must differ widely. Individual opinion varies a good deal in many cases in reply to such questions as the following :—

(a) What is the best age for treatment with appliances ?
(b) In the case under consideration, what type of appliances will produce the best result ?
(c) In the case in hand are extractions indicated or not ?
(d) If so, what tooth or teeth should be extracted ?
(e) At what age should the extractions be carried out ?

The grouping or classification of cases primarily for the purpose of systematising treatment is, in my opinion, erroneous. Every case requires individual consideration. Systematic classification is a helpful guide, nevertheless, if the rule of the individual is borne constantly in mind. In order to assist in reaching correct decisions in individual cases, especially regarding the above questions, it is desirable that cases come under observation and are recorded at the earliest possible age. When it is practicable for a case to be kept under observation for two years or longer before undertaking treatment, the answers to the questions often become more apparent through a study of the original records and their comparison with the later stage. For this reason we have many so-called reference cases which are first kept under observation for periods varying from six months to three or four years or even longer. For all of these cases the irregularities are recorded on the chart, and for many of them records in the forms of study casts and X-rays are obtained on the first visit. Treatment by appliances to be successful must be along the lines permitted by nature, and by this means any natural tendency towards correction can be detected. In private treatment the application of this method should start with the general dental practitioner. It may often prove of most valuable benefit to the patient as well as to the orthodontist.

Before dealing with the routine for cases treated with appliances I shall touch briefly on another point, namely that of habits which may be a factor contributing to an irregularity. This is a subject which in itself provides enough material for a paper and can only be mentioned at this time. Wherever possible such habits should be corrected before appliances are inserted; another point in favour of the pre-treatment observation period. Thumb-sucking, or finger-sucking is our classic example, and has a most detrimental effect in some cases, whereas it does not seem to leave its mark in others. This may possibly be due to the intensity of the habit, the nature of the tissues, especially the bone, and other factors requiring investigation, and concerning which a great deal remains unknown at present. It is my opinion that this habit exists at some period in many more cases than we suspect. Their correction of course, is a psychological problem essentially, and I should like to cite an interesting case.

The patient, a female, aged four years, had been sucking the right thumb, a large proportion of the time since a few weeks of age. Several methods to break the habit had been attempted by the mother. The characteristic deformity was present and was very pronounced. After discussing the matter with the mother in the presence of the patient, I stated that I should send the patient away for six months and would see her again at the end of that period to compare her condition with the original casts. Six months later the case showed a very marked improvement, and I sought an explanation from the mother as to how the habit had been overcome. The mother replied that the child had abandoned the habit from the date of the visit six months previously. She added that the little patient had worried a good deal at that time about my statement that " I would send her away for six months." Apparently she had misinterpreted the statement and feared that I planned to send her away to some terrible place.

Correct nasal breathing is often important although again mouth breathing seems to have little effect in some cases. As a part of treatment the correction of the habit is, I feel, frequently essential, and we often obtain the assistance of the staff of the Ear, Nose and Throat Department of the Royal Free Hospital and occasionally refer cases to the department of physical medicine for instruction and exercises in correct breathing. Many of these however, we undertake ourselves.

While assisting with the treatment of two young daughters of a friend and colleague I came across what seems a helpful method of improving a short upper lip. These children at the age of entering school took lessons in elocution which has resulted in a marked improvement, especially with the older child. The reason was obvious when she was asked to recite, for the movement of the upper lip was considerably more marked than it had been in ordinary speech. It is probable this can be achieved more successfully through speech therapy and we are at present investigating the possibilities of this field in collaboration with a speech therapist. Should it prove of value it is also a method which could be usefully employed during the pre-treatment observation period.

Ever since the opening of the Clinic the demand for treatment with appliances has exceeded our ability to deal adequately with the number of cases making application, and in spite of increasing the orthodontic staff on several occasions it has been necessary to compile a waiting list which unfortunately grew too rapidly from the outset, and with which it has only been possible to keep pace recently. All patients admitted to this list are, of course, obliged to complete all conservation and other treatment first. A long waiting list is most unsatisfactory. Many of the cases on our list however are under periodic observation, and not infrequently, when their turn arrives for treatment, it is postponed in order to follow any natural progress of the case for a longer period. A short waiting list is an advantage from another point of view. A certain number of patients meanwhile lose interest and the desire for treatment. It is probable that the majority of these would abandon treatment before its completion, if undertaken. The waiting list is divided into two sections, one section being for the more urgent cases, and patients are called alternatively from each section of the list. Occasional cases, the correction of which seems very urgent owing to the patient's age or the nature of the condition, are placed under treatment immediately. An example is where one or two upper incisors are occluding lingual to the lower incisors. Generally partial treatment only is undertaken for these urgent cases, in the first instance at least. One new appliance case is allotted to each one of the seven operators each week, except during the first or last month of his or her appointment. Extra cases are allotted if requested by the operator. For these patients study casts are made usually from plaster impressions for mixed or permanent dentitions. In markedly irregular cases Dentocol is used. Compound is the material of our choice for obtaining impressions of the deciduous dentition. A set of seven or ten X-ray films is taken before appliances are inserted. They are of value for determining the presence or absence of unerupted teeth, supernumeraries, etc. During active treatment cases attend, as a rule, once a fortnight, except those in the hands of operators who have been on the staff a year or more, when longer intervals between visits are permitted. Although I agree with the generally accepted principle that auxiliary springs, if properly adjusted, should not be altered more than once in four or six weeks, it has been my experience that in the hands of operators with less than a year's experience it is preferable that cases come under observation once a fortnight, although adjustments may be needed every second or third visit only. It requires a good deal of experience to become familiar with the action and reaction of appliances, and their component parts, and their correct adaptation and adjustment is a phase of technique which is mastered only after a good deal of practise.

With the exception of the vulcanising and polishing of plates, design and construction of appliances are carried out entirely by the operators, and are, of course, supervised by one of the members of the permanent staff. A thorough knowledge of the design of appliances is essential, and that of the mechanical procedure

involved in their construction is no less important, if the dental surgeon is eventually to give intelligent instructions to his mechanic. Too frequently advice and assistance is sought from mechanics to the profession regarding orthodontic cases.

As well as selecting patients from whom the essential co-operation appears likely to be forthcoming, cases are chosen also to some extent having regard to the irregularity. There are extreme cases in which, owing to age, and or the nature of the condition to be treated, the chances in favour of success seem most doubtful from the outset. Preference is given to cases in which the success of treatment appears most promising, although a certain number of the extreme type are selected for treatment with a view to seeing how much improvement can be obtained.

The present scope and knowledge of orthodontics, regardless of the many ingenious appliances and systems which have been devised, still leaves a good deal to be desired. There are certain definite boundaries which one is compelled by nature to remain within ; boundaries, the clarity of which becomes less obscure through wide experience.

Cases are restricted also according to their financial status. Throughout the work of the Clinic we endeavour to accept for treatment only patients whose family income does not enable them to obtain treatment privately. A greater margin is allowed however, for patients applying essentially for orthodontic treatment, a good many of whom are referred by members of the profession, partially because of the hardships which would be created by paying private orthodontic fees.

In an outline of this nature there are a number of details, principally administrative, and also of lesser importance, which must be omitted owing to time, and I propose, in conclusion, to show slides of several cases selected partially because of the result, and also because I hope they may possess points of some interest and value in connection with treatment.

Discussion.

The PRESIDENT said the paper was an extraordinarily interesting one, dealing in a most concise and masterly manner with a very comprehensive subject. Mr. Endicott had put into the paper a vast amount of detail, which he had condensed, and that made it difficult to discuss the paper in a short time : there were so many different sections, each of which might form a paper in itself. Her late husband had always hoped that the Eastman Clinic would one day be a centre for orthodontic research, and she still felt that that was possible and that Mr. Endicott was pointing the way to it. With regard to the long waiting list of children for treatment at the Eastman Clinic, it was of course undesirable to have a long waiting list, but how was the work to be overtaken ? In the different schools in London there must be a considerable amount of orthodontic work to be done. There were opponents to school orthodontics, but that was work which must be done. It was quite obvious that there should be conservative treatment first and the cleaning up of the children's mouths, but the orthodontic work was also important and it would become more urgent as time went on. She thought the Society should take up the

[*Continued on page* 90]

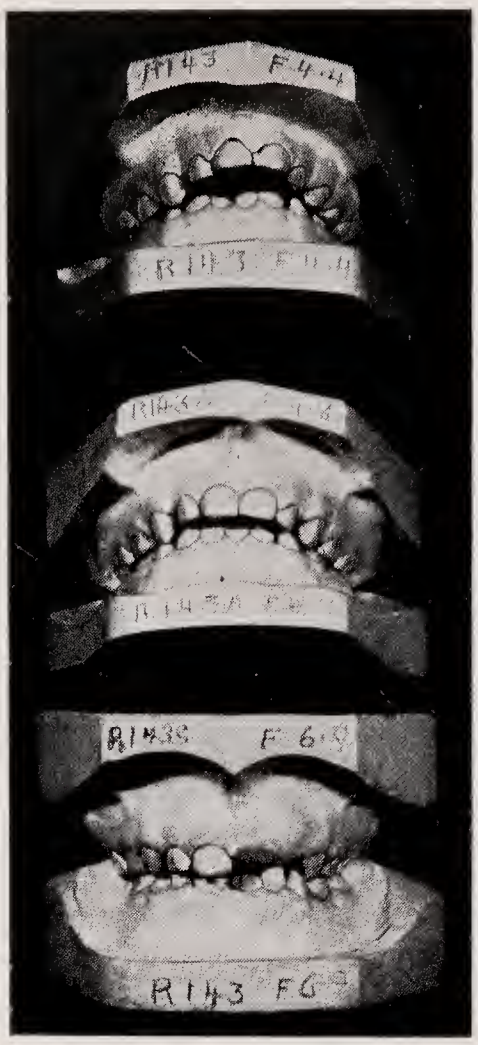

Fig. 1.
CASE R.143. Pt. Female. (Top) age 4 yrs. 4 mths. Thumb sucking habit (Middle) case at 4 yrs. 8 mths. Habit discontinued meanwhile. (Lower) at 6 yrs. 9 mths. $\frac{|\,1}{__}$ unerupted but normal.

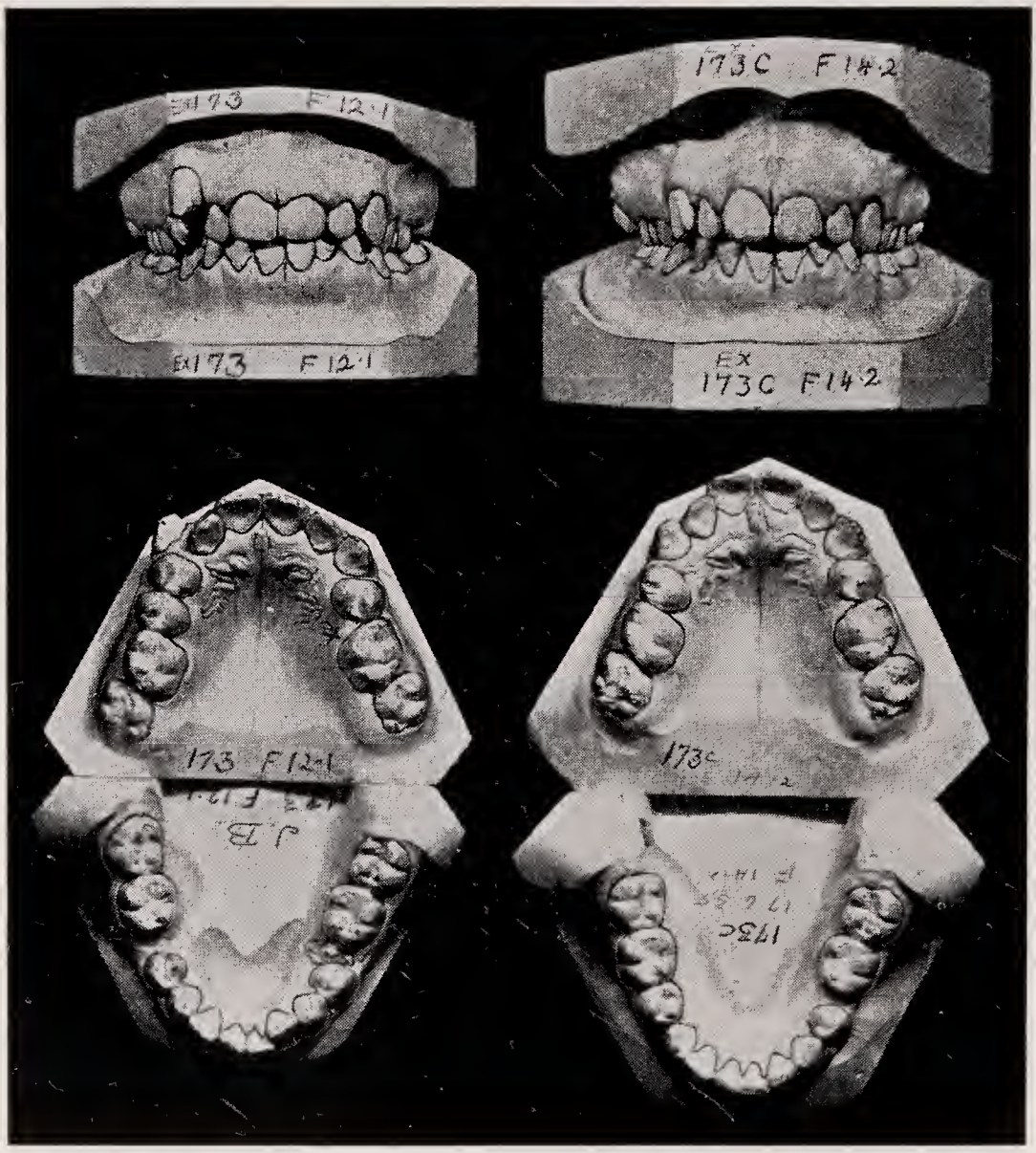

Fig. 2(a).
CASE EX.173. Pt. Female. (Left) age 12 yrs. 1 mth. Removal of $\frac{4\,|\,5.}{4\,|\,5.}$ (Right) case at 14 yrs. 2 mths. No appliances or exercises used.

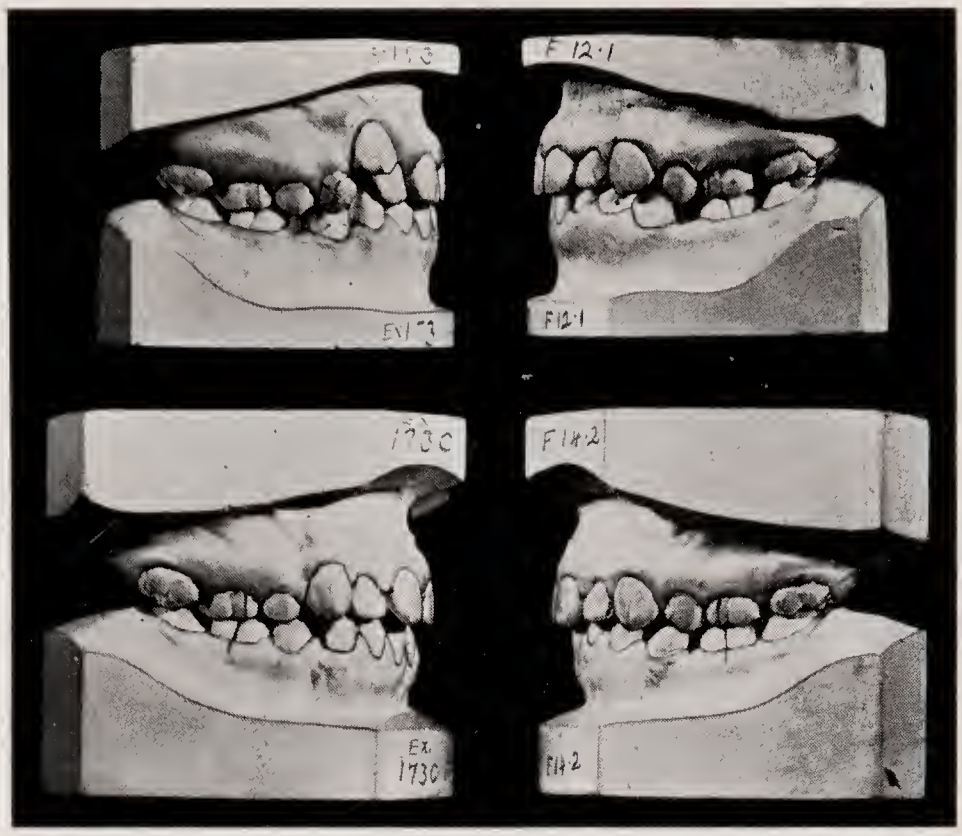

Fig. 2(b).
Same case as 2(a) (original casts at top).

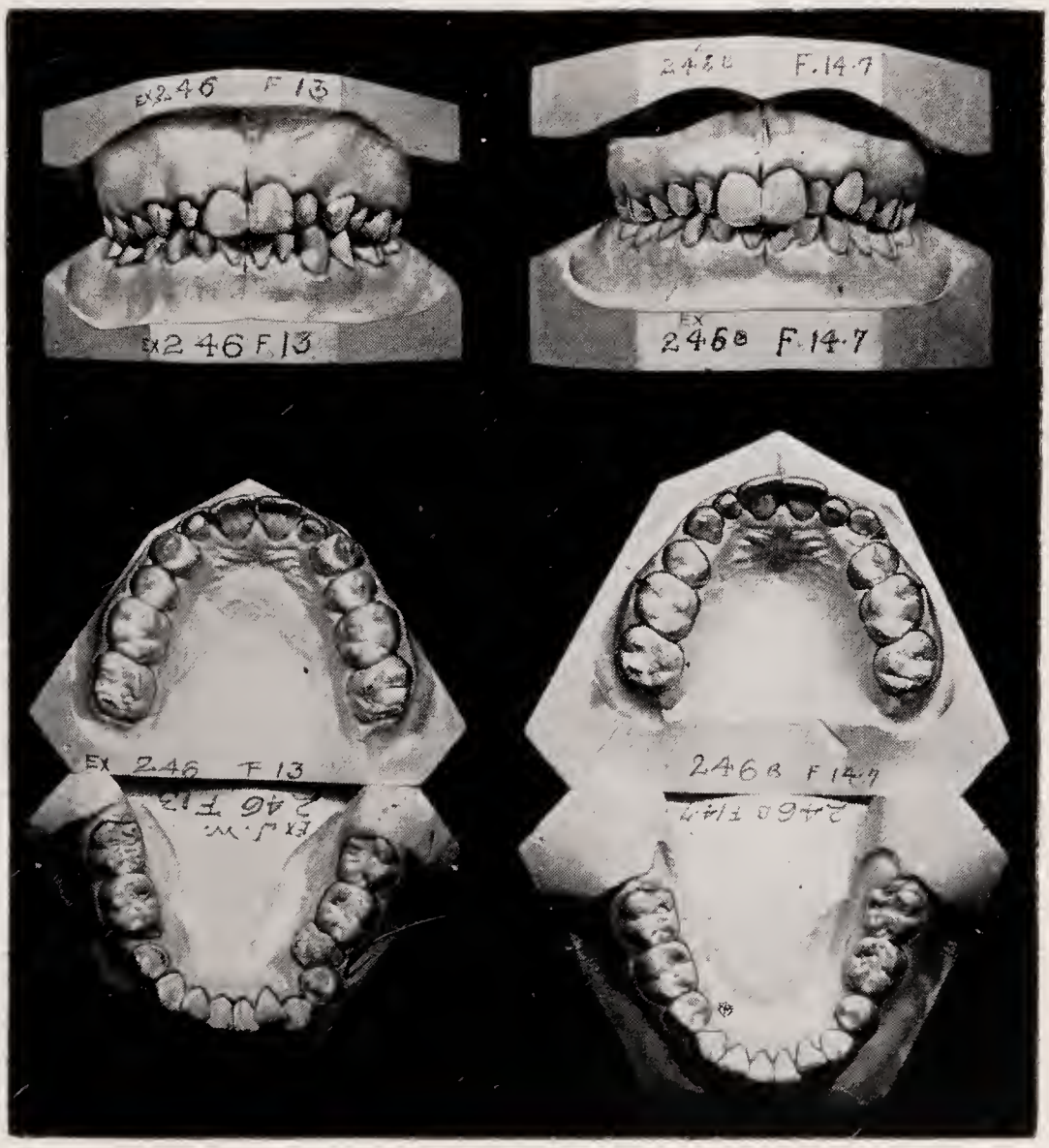

Fig. 3(a).
CASE EX.246. Pt. Female. (Left) age 13 yrs. Removal of $\frac{4|4}{4|5}$
(Right) case at 14 yrs. 7 mths. No appliances or exercises used.

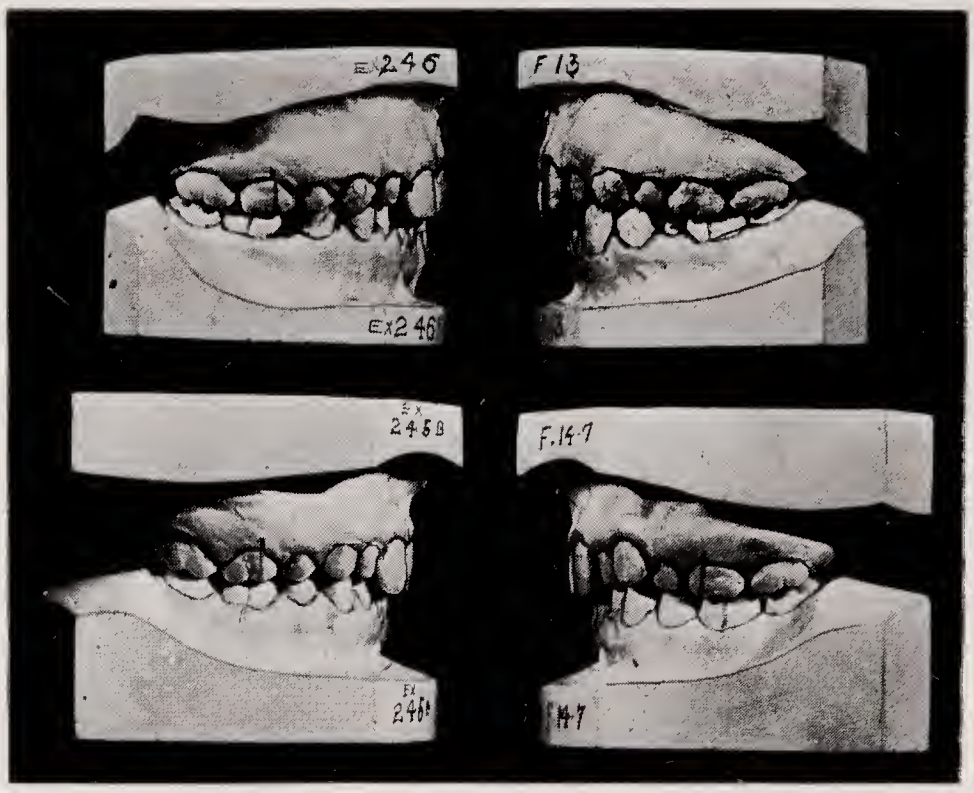

Fig. 3(b).
Same case as 3(a) (original casts at top).

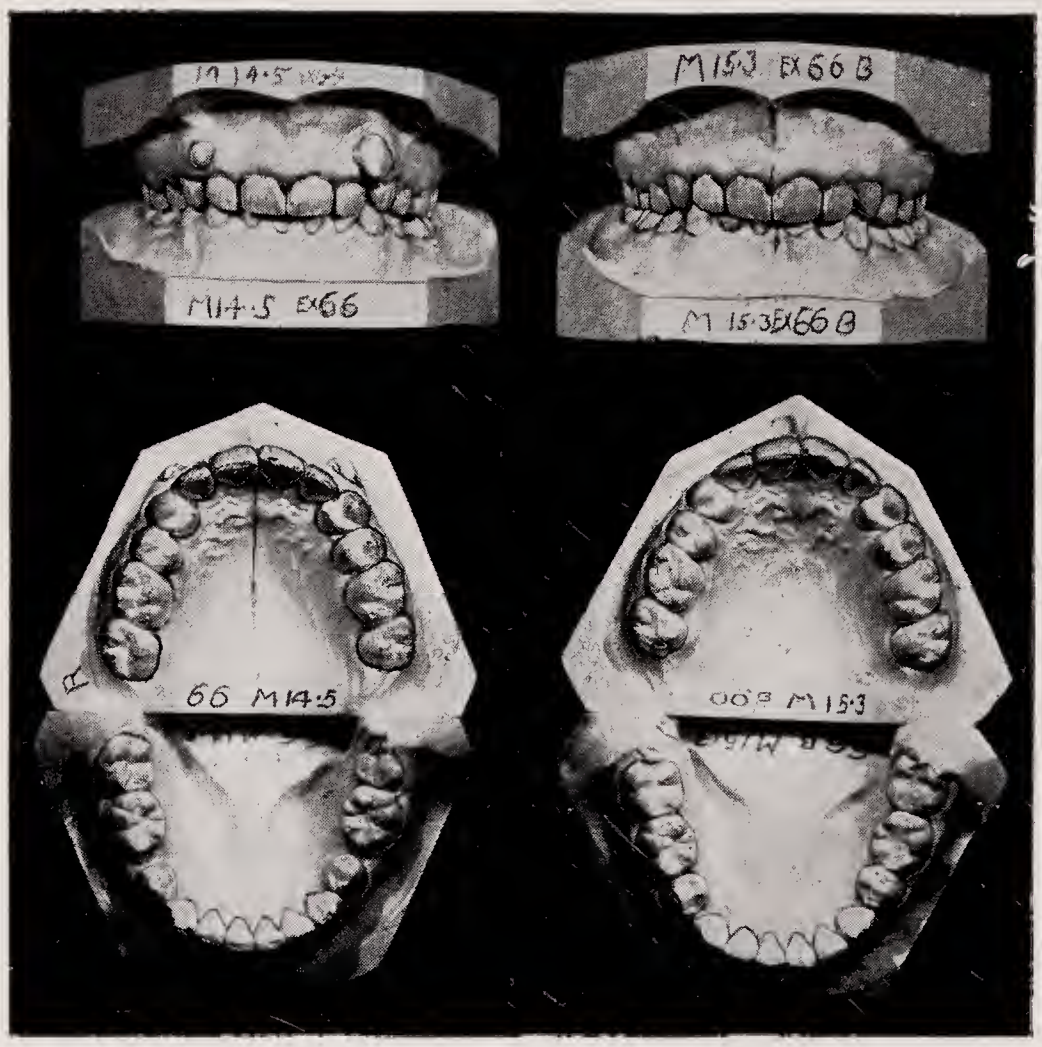

Fig. 4(a).
CASE EX.66. Pt. Male. (Left) age 14 yrs. 5 mths. Removal of $\frac{3 \mid 3}{4 \mid 4}$. (Right) case at age 15 yrs. 3 mths. No appliances or exercises used.

Fig. 4(b).
Same case as 4(a) (original casts at top).

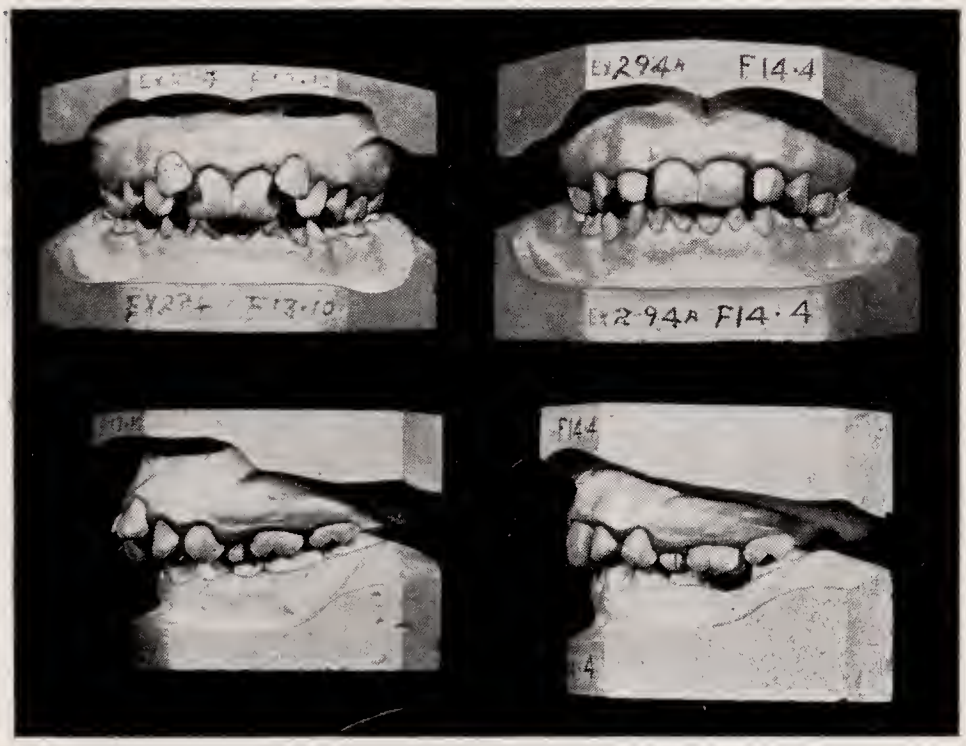

Fig. 5.
CASE EX.294. Pt. Female. (Left) age 13 yrs. 10 mths. Removal of $\overline{2}|2$. $|\overline{6}$ lost through caries. (Right) case at age 14 yrs. 4 mths. No appliances or exercises used.

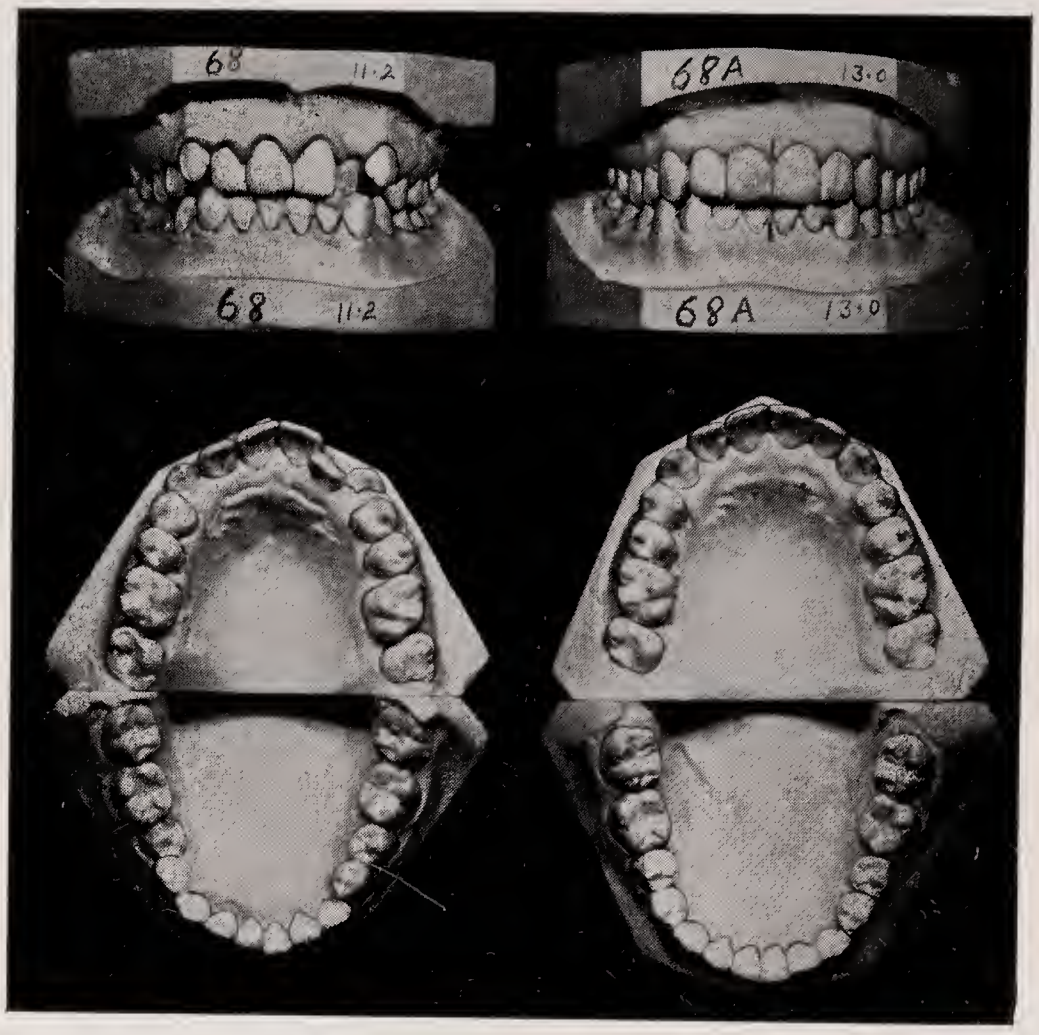

Fig. 6(a).
CASE 68. Pt. Female. (Left) age 11 yrs. 2 mths. (Right) case at age 13 yrs.; one year after removal of upper labial, lower lingual, and upper lingual appliances used with auxiliary springs.

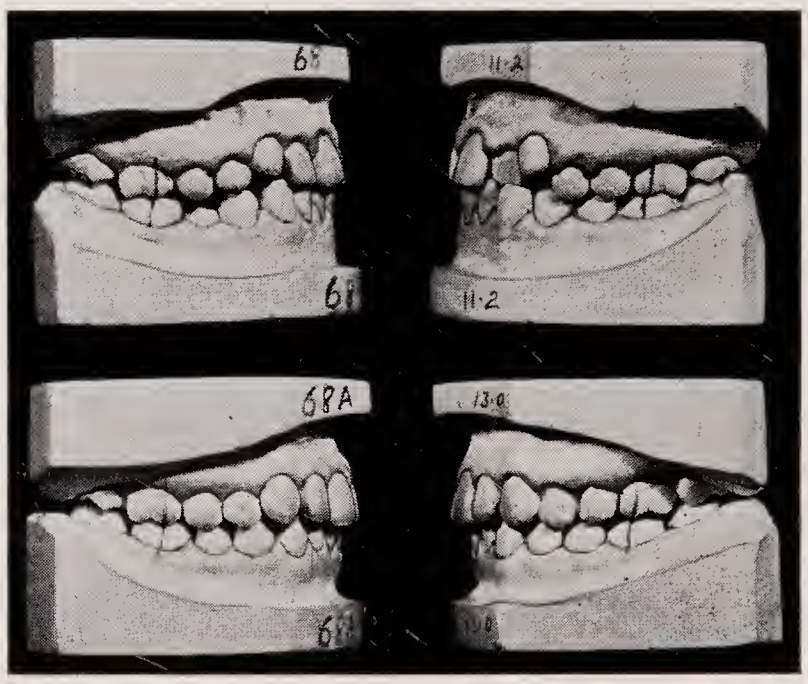

Fig. 6(b).
Same case as above (original casts at top). A recent examination showed a further natural improvement of the molar and premolar occlusion.

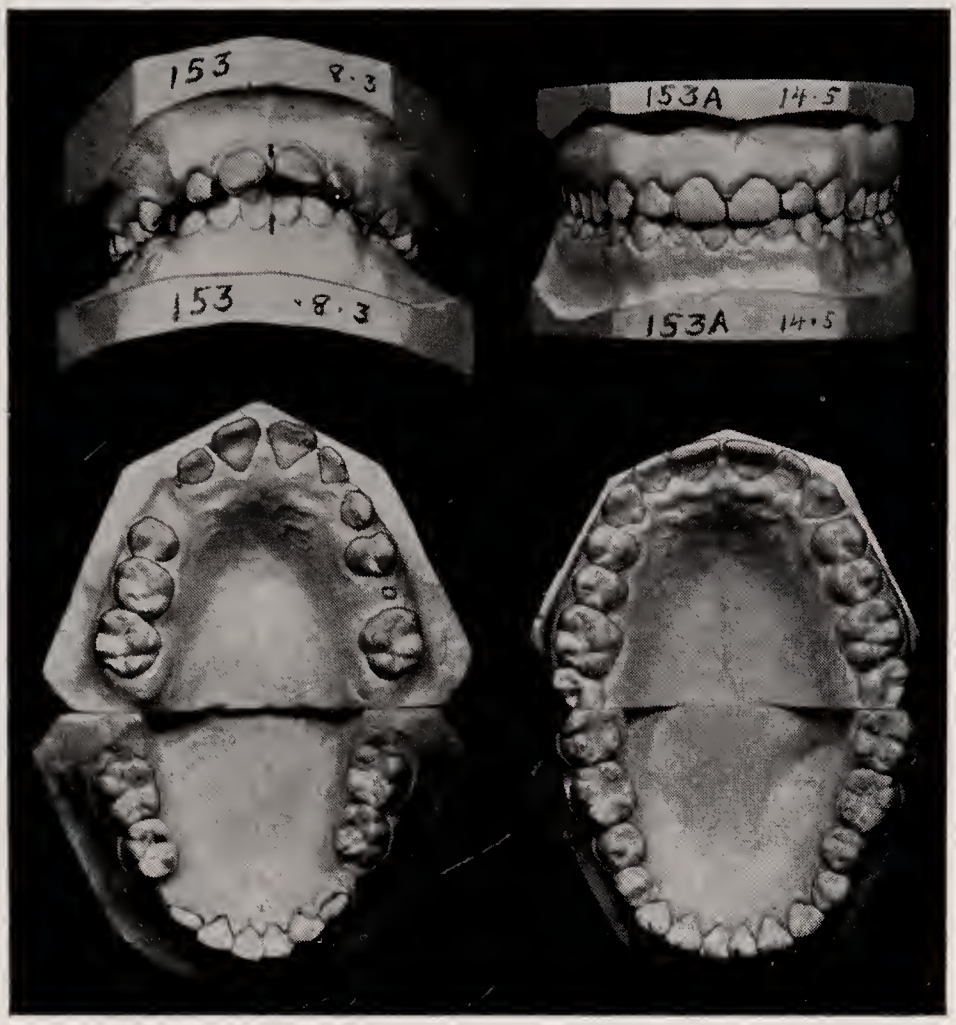

Fig. 7(a).

CASE 153. Pt. Female. (Left) age 8 yrs. 3 mths. (Right) case at age of 14 yrs. 5 mths. ; one year after removal of retaining appliances. Active treatment, interrupted by illness and rest periods, extended over about eighteen months, with an upper labial and lingual and a lower lingual appliance with auxiliary springs and intermaxillary traction.

Fig. 7(b).

Same case as above. A lip disc and breathing exercises were also used.

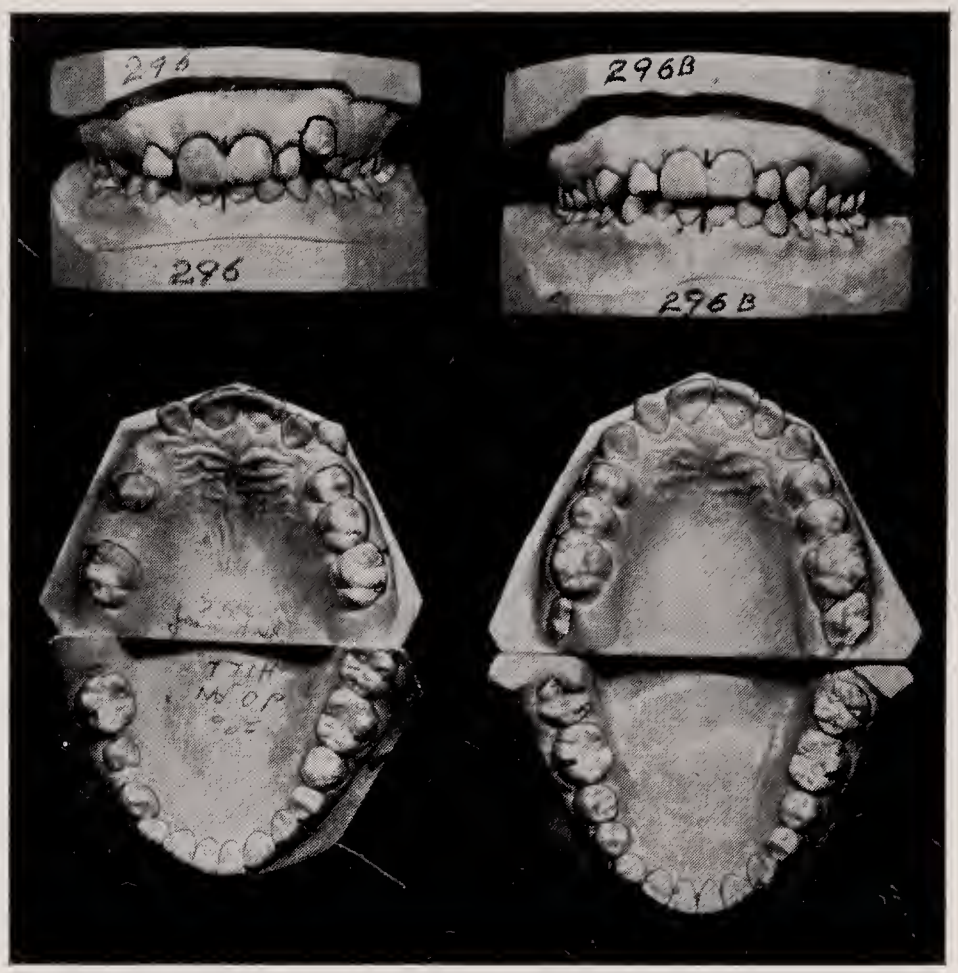

Fig. 8(a).

CASE 296. Pt. Female. (Left) age 11 yrs. 9 mths. (Right) case at 15 yrs. Active treatment with an upper lingual appliance and auxiliary springs over a period of 9 mths. The $\underline{2}|$ was moved into alignment but returned later to its original position despite correction on a second occasion and a long period of retention.

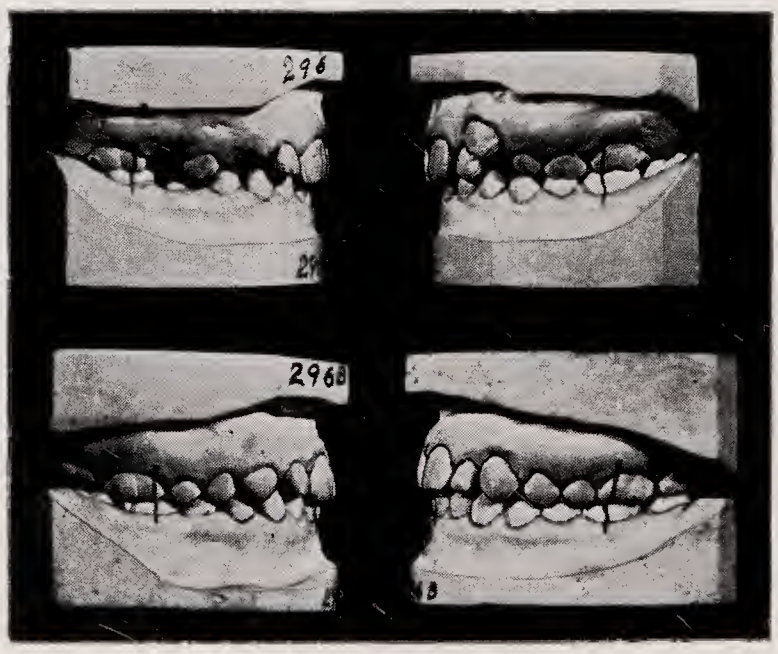

Fig. 8(b).

Same case as above. Probably a similar alignment would have resulted in this case without treatment.

Fig. 9(a).

CASE 256. Pt. Female. (Left) age 12 yrs. 2 mths. (Right) case at age 14 yrs. 2 mths. Active treatment extended over eighteen months approximately. Upper and lower lingual arches with auxiliary springs were used for bilateral and anterior expansion.

Fig. 9(b).

Same case as above. Extraction of four premolars was considered but not carried out. A history of tuberculous glands.

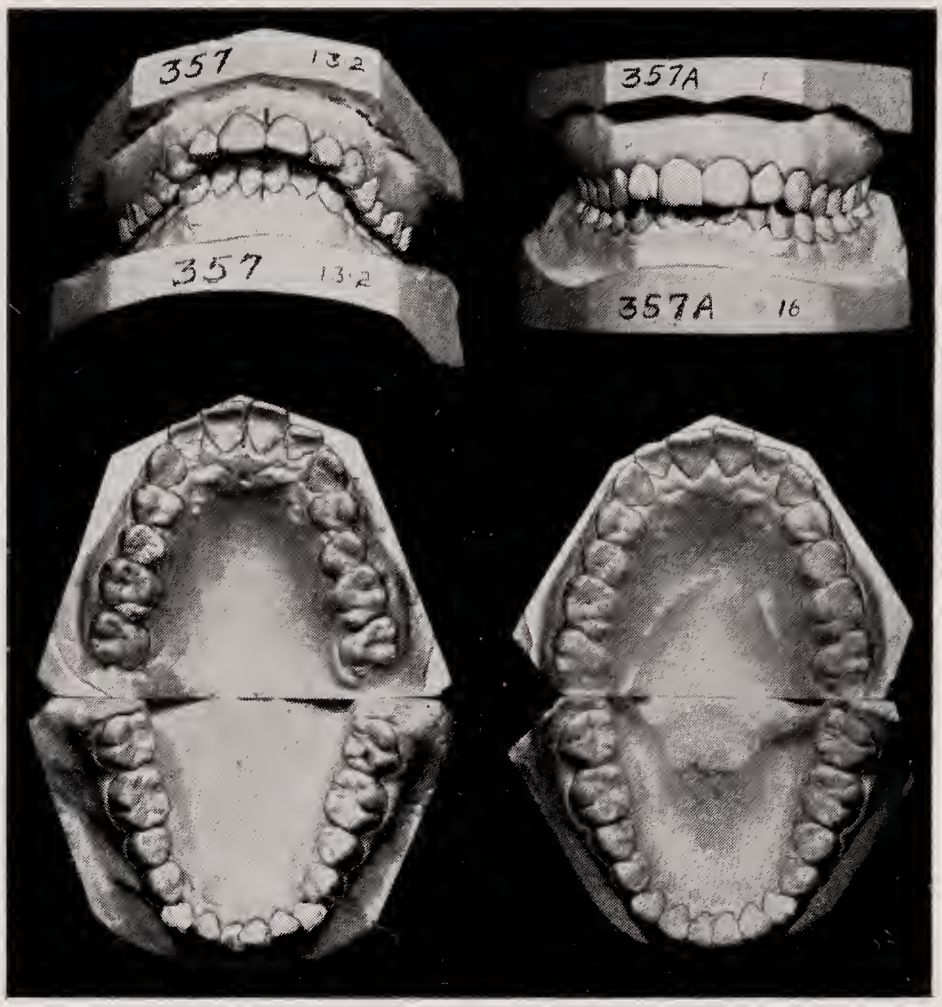

Fig. 10(a).

CASE 357. Pt. Female. (Left) age 13 yrs. 2 mths. (Right) case at age 16 yrs., eight months after removal of appliances. During this period patient failed to wear a Hawley retainer provided and a slight loss of the bilateral expansion occurred. Active treatment extended over two years with upper labial and lingual and lower lingual arches with auxiliary springs and intermaxillary traction.

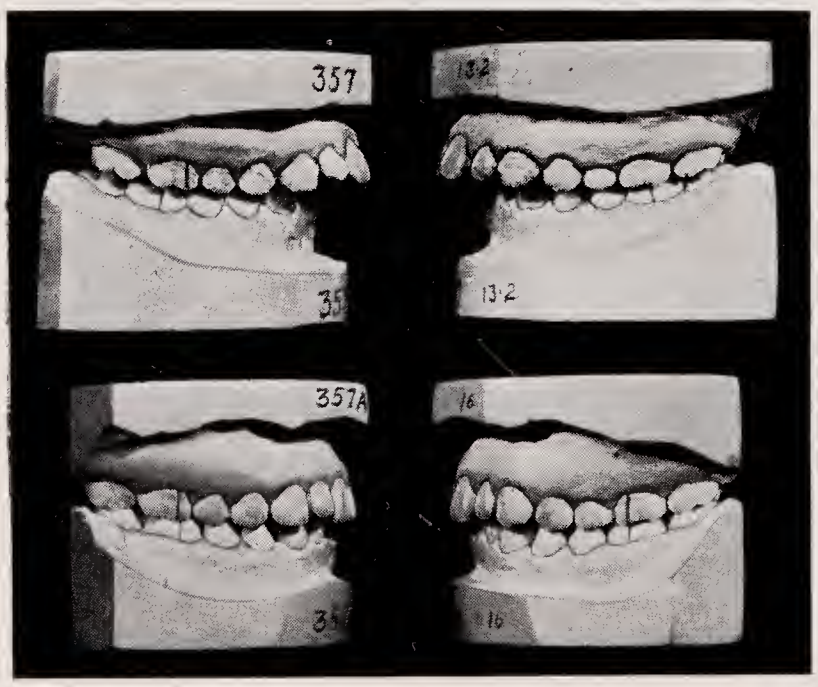

Fig. 10(b).

Same case as above.

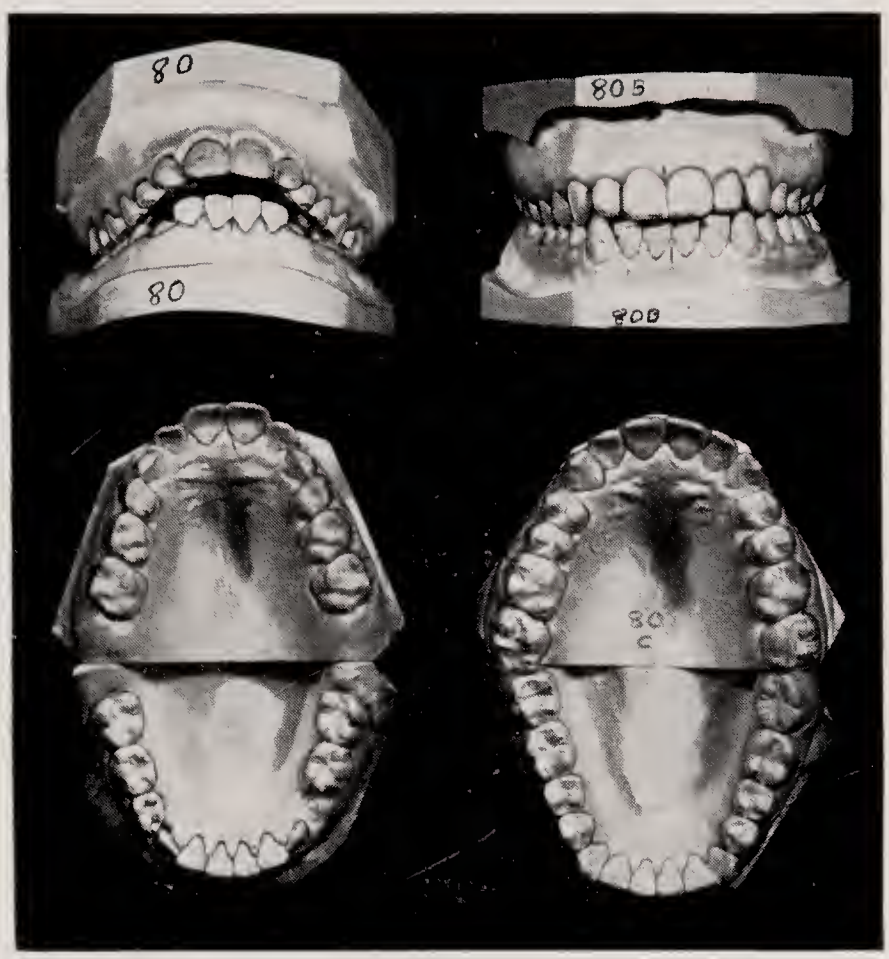

Fig. 11(a).

CASE 80. Pt. Female. (Left) age 10 yrs. 4 mths. (Right) case at age 15 yrs. 7 mths. ; eight months after removal of retention. Active treatment extended over three years and included rest periods. Upper labial and lingual and lower lingual arches with auxiliary springs and intermaxillary traction employed. The anterior open-bite was associated with a habit of protruding the tip of the tongue and was counteracted by a bar across the upper lingual arch anteriorly.

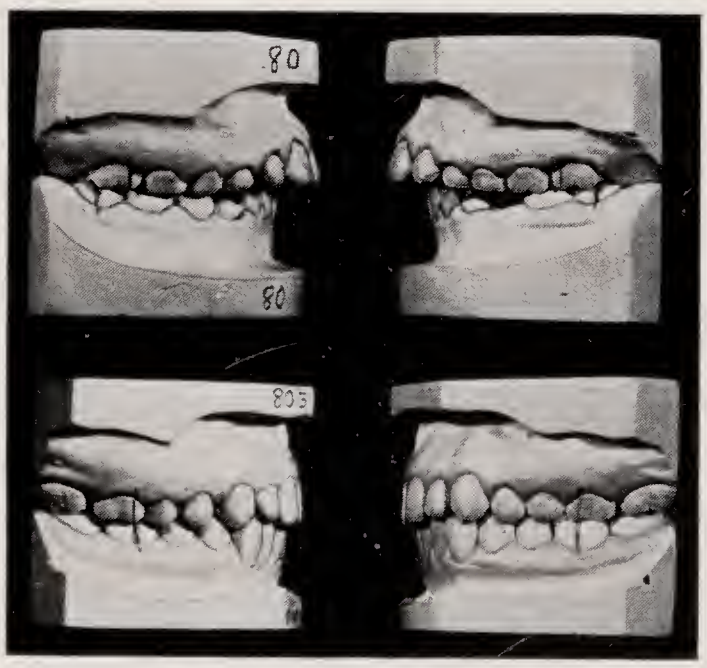

Fig. 11(b).

Lateral views of same case. A recent examination shows no change.

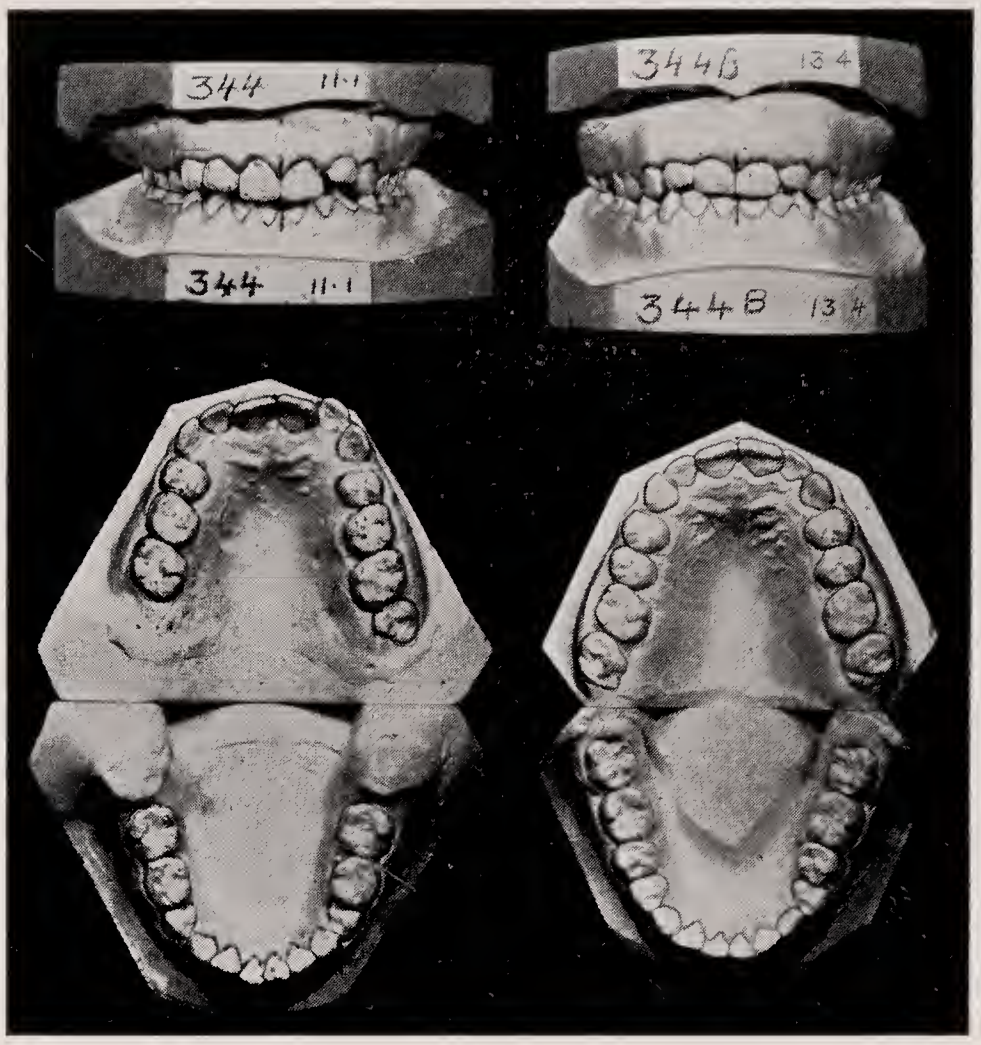

Fig. 12(a).

CASE 344. Pt. Female. (Left) age 11 yrs. 1 mth. (Right) case at age 13 yrs. 4 mths.; six months after the discontinuation of treatment because of lack of co-operation. Active treatment extended over twenty-two months with upper labial and lingual and lower lingual arches with auxiliary springs and intermaxillary traction.

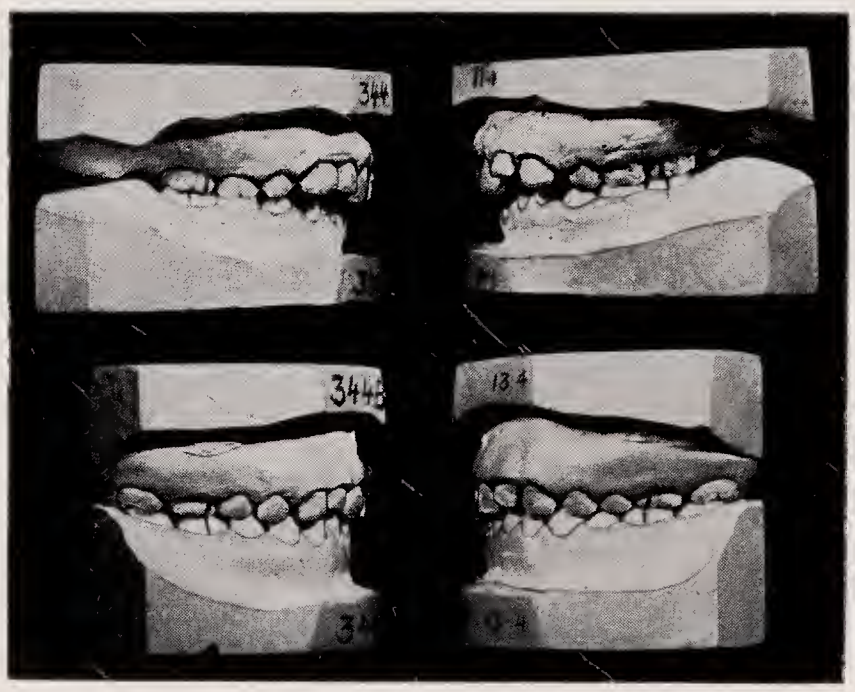

Fig. 12(b).

Lateral views of above case.

Fig. 13(a).

CASE 749. Pt. Male. (Left) age 11 yrs. (Right) case at age 11 yrs. 8 mths.; six weeks after the removal of an upper labial appliance used with auxiliary springs to bring 2 1 | 1 2 labially.

Fig. 13(b).

Lateral views of above case. Further treatment may be necessary later.

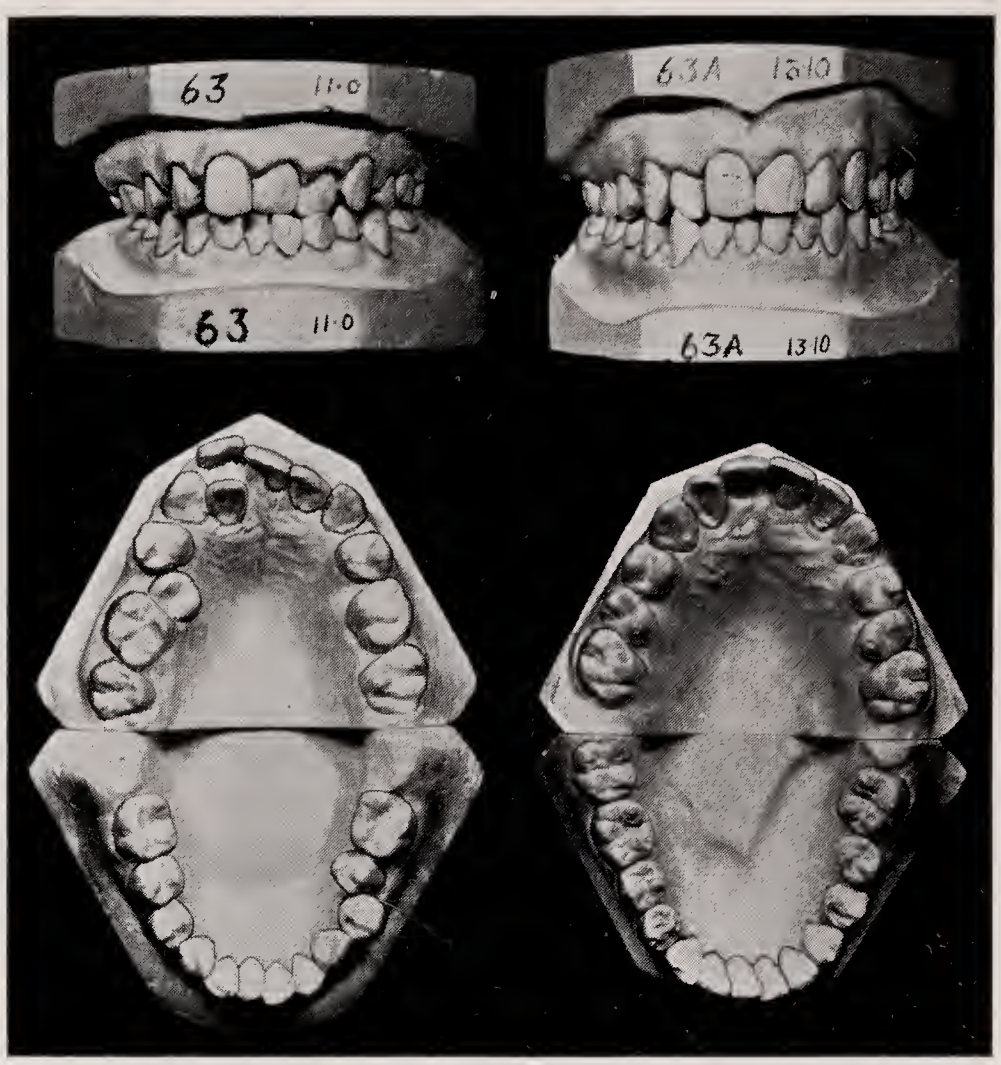

Fig. 14(a).

CASE 63. Pt. Male. (Left) age 11 yrs. (Right) case at age 13 yrs. 10 mths.; eight months after removal of upper labial and lingual and lower lingual arches and auxiliary springs. $\frac{6|}{|6}$ lost through caries, $\underline{|6}$ also removed.

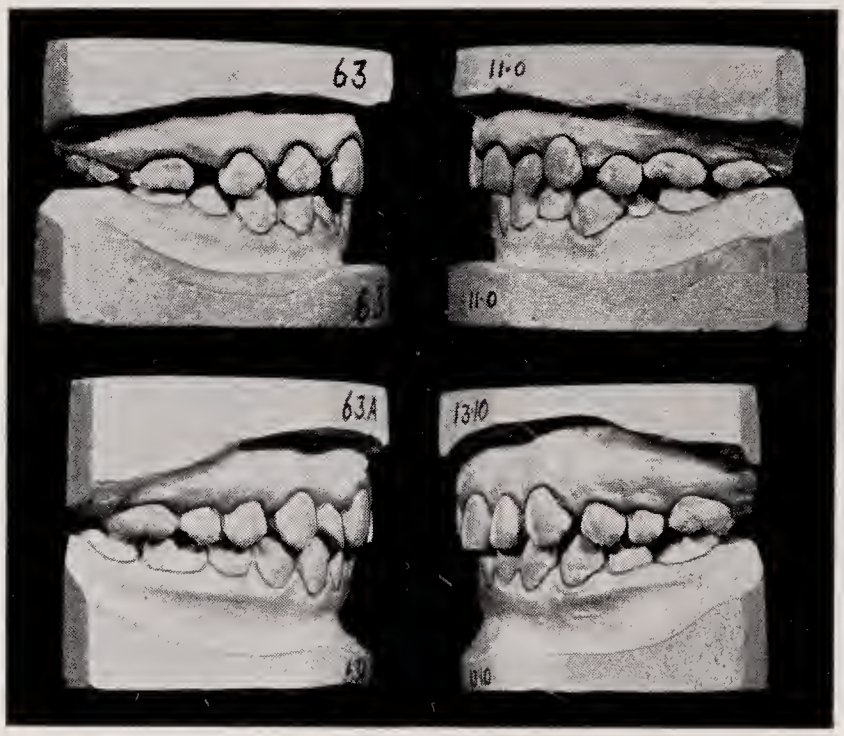

Fig. 14(b).

Lateral views of above case.

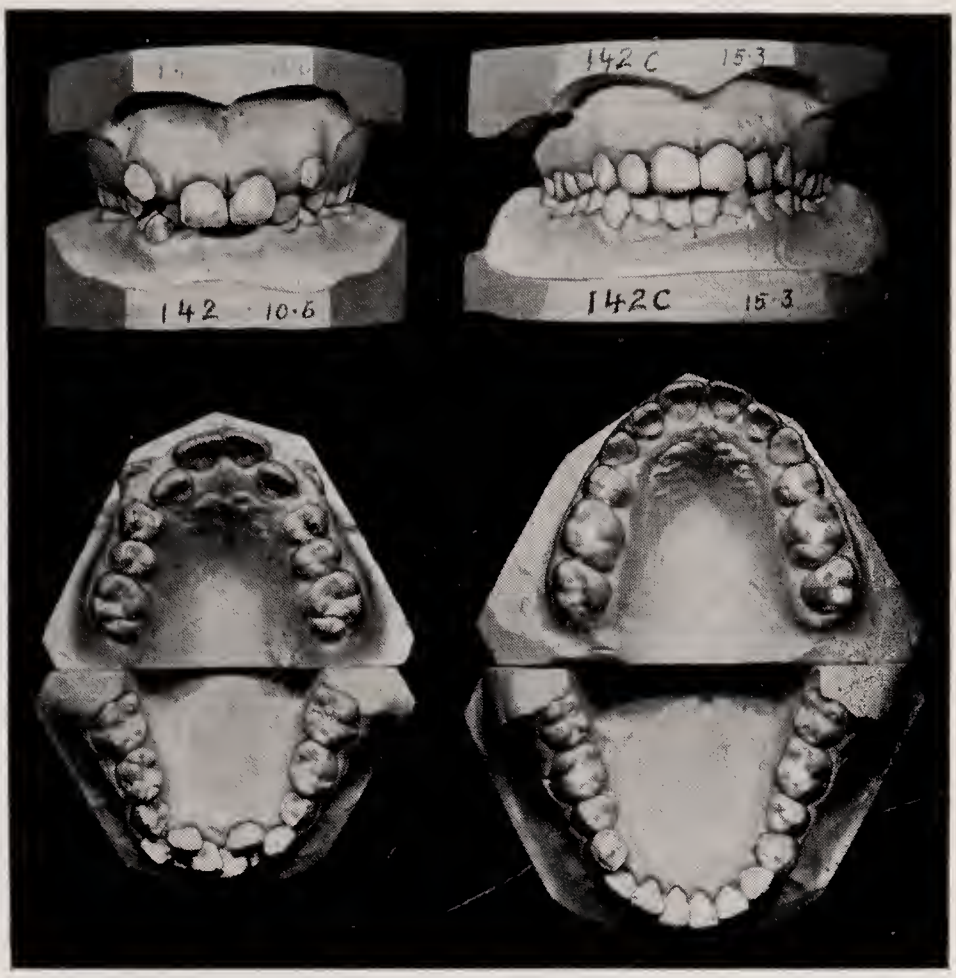

Fig. 15(a).
CASE 142. Pt. Female. (Left) age 10 yrs. 6 mths. (Right) case at age 15 yrs. 3 mths.; after removal of lower lingual retainer and two years after removal of upper appliance. Active treatment extended over $2\frac{1}{2}$ years with upper labial and lingual and lower lingual arches and auxiliary springs. $\underline{4 \mid 4}$ removed.

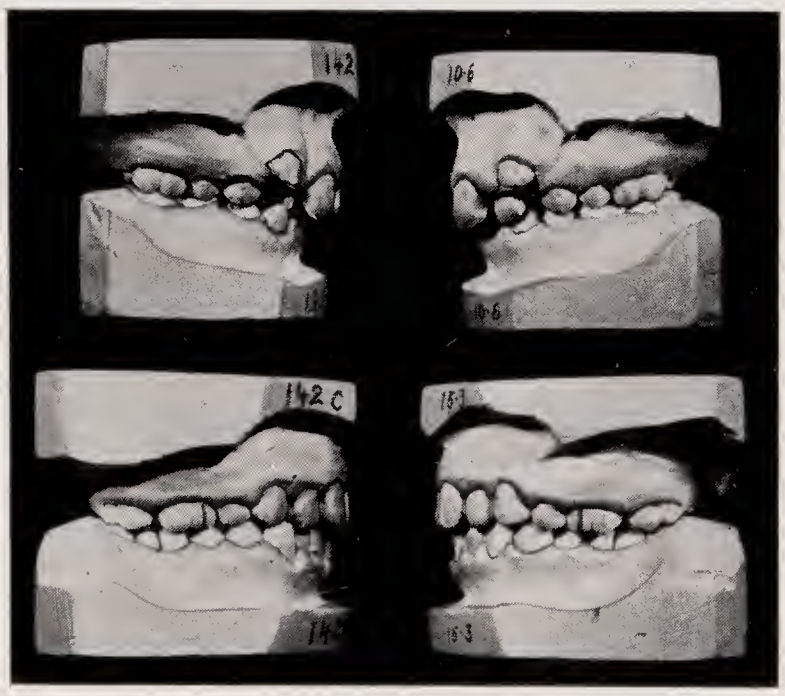

Fig. 15(b).
Lateral views of above case. Probably treatment could have been simplified in this case by removing $\underline{2 \mid 2}$ instead of $\underline{4 \mid 4}$.

I have pleasure in acknowledging and expressing my thanks to past and present members of the staff for their work in carrying out the treatment of the above cases.

question and formulate some scheme whereby the orthodontic work could be undertaken. Mr. Endicott had pointed out the way. With regard to the extraction of the 3's, did not Mr. Endicott find that in doing that he flattened the face? She had done it on one or two occasions and had been very sorry afterwards. With regard to the question of the symmetrical extraction of the 6's, she would like to ask Mr. Endicott whether, when the 8 erupted, there would not be overcrowding on the side where the 6 had been left in. She had seen a case in which the mouth was put right about the age of 14, and then later on, between the ages of 18 and 19, when the 8's erupted the cheek teeth came forward and pushed the canines outside again. She wished to offer her very sincere personal thanks to Mr. Endicott for his paper.

Dr. S. FRIEL said that Mr. Endicott had shown several cases in which all four upper incisors were inside the lowers, and all those cases were under treatment for many months, sometimes years. He thought that time could be greatly reduced by the use of a bite-plate with a spring on the upper arch. In such cases, which were not cases of a true protrusion of the lower jaw, the incisors often went over in a few weeks when the bite-plate to which he had referred was used. Mr. Endicott had shown that the Eastman Clinic did a tremendous amount of good work for the children in the district which it served, and in that way it justified itself, but as a post-graduate school he was not quite sure that it did justify itself. He understood that Mr. Eastman's idea in founding the clinic was that it should be run by newly qualified dentists who had all the knowledge necessary but required practice in technique, both in general dentistry and in orthodontics. Possibly for 99 per cent of dentistry they had the foundation knowledge, but for the remaining 1 per cent, which was unfortunately orthodontics, he thought the teaching in the dental schools of this country and of Ireland did not give them the foundation knowledge. If students were given fundamental knowledge in orthodontics, it would involve the sacrifice of some other part of dentistry which was of far greater importance. All dentists did not agree with him in that, including a very prominent member of the profession, Sir Norman Bennett. Sir Norman thought that orthodontics was a very simple subject, for which one did not require very much knowledge, and that it was the orthodontic specialists who made the matter so intricate that nobody else could understand it and discouraged other dentists from treating an orthodontic case. He thought that Sir Norman Bennett was entirely wrong, and he did not think he would be contradicted when he said that any major progress in orthodontics had been made by specialists. In the Eastman Clinic the newly qualified undertook orthodontic work without having a fundamental knowledge of it, and, as far as he could gather, there was no one there to teach them. He could guarantee to teach a post-graduate student in four weeks to make any appliance that he could make himself, but it would take him another six months of individual tuition to make the post-graduate student understand orthodontics, and he did not think that was done in the Eastman Clinic. He doubted very much whether it was wise to send graduates out into the world as orthodontists without a much greater knowledge than they obtained at the Eastman Clinic. He agreed with the President that the Eastman Clinic was a wonderful place for research, but it had been a bitter disappointment that hardly anyone there, with the exception of Mr. Endicott, had added a single thing to orthodontic literature. He thought that was a terrible waste of good material. The only way to make a graduate into a good orthodontist was to give him some piece of simple research to do; he could choose it himself or it could be chosen for him, but it must be something on which he would have to

use his wits and read what other people had written, collect his material and publish it. Clinics such as the Eastman Dental Clinic should publish papers biannually.

Mrs. MICHAELIS said she would like to thank Mr. Endicott for his extremely interesting paper. With regard to Case 153, in which Mr. Endicott put a gag on the 6's, she would like to know what that consisted of, how it was made and why it was used. It did not seem to her that the bite was particularly close. The other case in which she was especially interested was that in which the canine teeth were extracted, and she wondered why Mr. Endicott chose to extract them rather than the laterals. With reference to the Class II, div. 2, cases, in which the centrals were instanding and the bite was extremely close, were the incisors moved forward from the buccal side with a buccal bow and bands, or was the bite raised first, before the incisors were moved forward? In such cases it was extremely difficult to avoid the lower incisors impinging on a lingual spring if a lingual bow were used.

Mr. J. L. DUDLEY BUXTON said he did not consider that orthodontics taken as a scientific subject, could be mastered in ten years or even fifteen years. He believed it was a subject which required so much study that it needed the kind of brain that was not often found in the dental student to-day. Perhaps those who criticised the Eastman Dental Clinic did not realise the difficulties with which Mr. Endicott had to contend. As director, Mr. Endicott had to deal with all types of patients, not only on the orthodontic side but also on the side of general dental surgery. He believed that Mr. Endicott dealt with all the other cases just as efficiently as he dealt with the orthodontic cases. He took a number of qualified dentists from the University College Hospital Dental School and made them into efficient practitioners, teaching them the elements of orthodontics. They stayed with Mr. Endicott for about a year, and in a year they ought to learn something about orthodontics, if, as had been said that evening, it was possible for a man to become an orthodontist in six months. Therefore he felt that the Eastman Clinic had not altogether failed, and in fact he thought it was a very sound institution indeed. Mr. Endicott was an exodontist and a master of dental surgery, as well as an expert orthodontist; therefore he saw what might happen in the future and often saved his patients from being in the hands of an exodontist later on, when the third lower molars erupted. Personally he heard a great deal about the incisors doing this, that and the other. When a child said "Six sausages for six and sixpence, most expensive," he pushed his tongue against the lower incisors all the time and the lower incisors might be pushed forward, but when a child said, "The clink of change in church," he did not push his tongue against the upper incisors but against the palate, and the upper incisors were not pushed forward. He often wondered whether the more affectionate type of child had the short upper lip which gave orthodontists so much trouble.

Mr. H. CHAPMAN said it had given him a great deal of pleasure to listen to Mr. Endicott's paper, particularly as he found that Mr. Endicott did a great many things that he himself did. He had thought that perhaps no one else was so unorthodox. He felt therefore considerably supported after seeing Mr. Endicott's excellent slides. One very important point which Mr. Endicott had made at the beginning of his paper was that each case was an individual case and required individual consideration. He had discovered that sometimes when one made a statement it was misinterpreted and things were done contrary to what one expected simply because one had said, "Do so-and-so" with reference to a particular thing and on another occasion

that same solution was applied to a different problem with perhaps some superficial appearance of similarity. It seemed to him that there must be a considerable amount of research work being done at the Eastman Clinic at the present time, though it was not called research work. For instance, there was the question of observation before treatment. What was that but research to see whether treatment would actually be necessary? Mr. Endicott had said in his paper that if he were called upon to give advice to-day on some of the cases he had shown he would probably treat them without appliances at all instead of with appliances as had been done, and surely that was the result of excellent research work of a practical nature. Mr. Endicott had not said in what way the work at the Eastman Clinic was financed. He gathered that the patients contributed very largely to the cost of their treatment, but he would like to hear what Mr. Endicott had to say on the subject. The President had referred to the fact that some people were opposed to orthodontic work being done in school clinics. He might be included as one of those. He was not opposed to orthodontic work being done at the Eastman Clinic or any other place if it were not financed from public funds, but whilst so much conservative work for children was left undone it seemed to him that that should be completed before orthodontic treatment was undertaken at all, because the former is a health service, whereas orthodontics is primarily a social service and on quite a different plane. He wished to refer to one of the cases that Mr. Endicott had shown, namely, the one in which a first upper premolar was extracted on one side and a second on the other. He thought that the result of the extraction of the first premolar was much better than the result of the extraction of the second premolar, because of the better contact points (when the first premolar was removed). That was a matter which seemed to him to be very important. He had not been able to produce a case, as Mr. Endicott had, and he congratulated the author upon it.

Mr. Russell Marsh said he wished to add his thanks to those already tendered to Mr. Endicott for his very illuminating and interesting paper. He thought all the members had had a very high opinion of the Eastman Clinic before they had heard Mr. Endicott's paper, and they would now have an even higher opinion of the work being done there. Whatever might be the arguments with regard to post-graduate work, there was no doubt in his mind that the public benefited greatly from the work done at the Eastman Clinic. There was no other place in London where so many orthodontic cases could be treated, and he would like to ask Mr. Endicott whether there was a prospect of an unlimited extension of the orthodontic department at the Eastman Clinic or whether there must be some limitation to it. If there had to be a limitation owing to lack of funds, was there any possibility of inaugurating at the Eastman Clinic a service for patients who could pay a sufficient sum to cover all expenses? There was a very great discrepancy between private orthodontic work, however reasonably the dentist might charge for his time, and hospital services, where time counted very little indeed. He had recently been asked to read a paper before the P.D.S.A. on the subject of Orthodontics for the General Practitioner, and he had found it a very difficult subject. The conclusion he had come to was that, in the absence of sufficient orthodontic services, the members of a society such as the British Society for the Study of Orthodontics must do all they could to help the unqualified general practitioner or the general practitioner with a low fee practice, and that such cases as could be treated by him, with a little dental knowledge, must be left in his hands. He went so far as to suggest, however, that such men should, whenever

possible, take advice, and he was immediately bombarded with questions as to where they could get that advice. Risking a possible breach of professional etiquette, he suggested that they might send cases either to orthodontic specialists, who might conceivably be willing to help at a reduction of their normal fee, or to such institutions as the teaching hospitals and the Eastman Dental Clinic. He could discuss with Mr. Endicott afterwards the question whether it would be possible for such advice to be given. With regard to the ordinary cases at the Eastman Dental Clinic, when it was necessary to remove temporary teeth, were the patients referred automatically to the orthodontic department for retention devices to retain the spaces? He felt that, as far as post-graduate work was concerned, leaving orthodontics aside, the curriculum of the student was so greatly overcrowded that a place such as the Eastman Clinic, where he could work for six months or a year after he had completed his training, filled a long felt want, and if there were more such places it would be a great benefit to the newly qualified student.

The PRESIDENT said that Mr. Russell Marsh's remarks had reminded her of a project which she had long had in mind, namely, that the Eastman Clinic should be a post-graduate school of orthodontics and that those who wished to know more about orthodontics should pay a good fee to the Eastman Clinic and go there for a recognised course in orthodontics. That would enable more of the patients on the waiting list to receive attention. That was perhaps a subject which Mr. Endicott could not discuss, but she felt there was a need in this country for a school of such a description, and there were all the facilities for it at the Eastman Clinic.

Mr. C. L. ENDICOTT, in replying to the discussion, thanked the President and the other speakers for their kind remarks. Several speakers had referred to the question of research, which was a subject that Dr. Friel and he had discussed on several occasions. At the Eastman Clinic there was a wealth of material, a great deal of which was collected in the form of X-ray photographs and records and models, but it was difficult to get people on the staff to take an interest in it. The young people on the staff were there for six months or a year; the necessary treatment occupied all their time during working hours, and there was no fund for research work. The profession or the members of the British Society for the Study of Orthodontics could do two things which would solve the problem. First, they could stimulate in the student, before he came to the Eastman Clinic, an interest in research work, and, secondly, they could provide a fund so that the young people on the staff of the Clinic could be paid for doing extra work in their own time. He hoped that any members of the Society who had wealthy patients who were interested in research would tell them of that project, and he would do everything he could from his side. With regard to the President's question as to whether the extraction of the upper 3's caused the face to flatten, he did not like taking out one upper 3 on one side or the other, but there were certain cases, such as the one he had shown, in which if both upper 3's were taken out the result was very satisfactory. If there was any flattening at all it took place on both sides and was practically unnoticeable. As to the President's suggestion that, in the case in which the lower 6 was left on one side, there would be overcrowding when the third molars came through, the patient had not got the third molars yet, but he would keep the suggestion in mind and see what happened later, if he could keep track of the patient. Certainly there might be a tendency to overcrowding in such a case. He wished to thank Dr. Friel for his suggestion with regard to the bite-plate. It

had not occurred to him to use that particular appliance for the purpose in question, although he had seen Miss Clinch demonstrate it at the meeting of the European Orthodontic Society and had been very much impressed with some of the results which she obtained in a very short time. Since he had received that very valuable help from Miss Clinch he had corrected several cases by the use of such an appliance. He was sorry that Dr. Friel thought the Eastman Clinic did not justify itself as a post-graduate school, but he was very pleased that some of the other speakers did not agree with Dr. Friel in that respect. He might answer Dr. Friel by saying that all those who had been in the orthodontic department of the Eastman Clinic for six months or longer had assured him, in some cases very emphatically, that it had been well worth their while.

With regard to Mrs. Michaelis's question about the case in which gags were used on the 6's, he thought everyone would agree that it was a very difficult problem to improve deep overbite, and it was somewhat doubtful how much could be achieved. In certain cases an improvement occurred, but whether that improvement was the result of the use of various types of appliances or whether it came about naturally was impossible to say. Only that day he had seen a case in which no appliance at all had been used and a deep overbite of the incisors had improved very considerably in a period of about a year, coinciding with the eruption of the premolars. Unfortunately there were a great many cases in which one did not see any improvement of that kind taking place. He did not quite understand Mrs. Michaelis's last question, and, in order to save time at the moment, he would discuss it with her afterwards. He wished to thank Mr. Buxton for his very kind remarks. He felt flattered at being called an exodontist. He had taken out two teeth last year ! With reference to Mr. Chapman's remarks about research, there was a great wealth of material at the Eastman Clinic, and quite recently he had discovered two young men who were anxious to do some research work. One of them had already got some very interesting work in hand. So far as he himself was concerned, his hands were already full. He only wished that he had time to go into all the material that had been collected and to publish the results of his work periodically, as Dr. Friel had suggested the results of such work should be published, but the routine work for which the benefactor had provided must naturally receive first attention. With regard to Mr. Chapman's statement that he preferred to extract the 4's because the contact points were better, he had not noticed that the contact points were better in that case, but he would pay more attention to that question in future. In reply to Mr. Russell Marsh's question about the prospect of increasing the work, the present limit of expansion had now been reached, even in the orthodontic department. Patients were now restricted to the County of London, and he thought that in the near future they would have to be restricted to an even smaller area. With all the work that was being done in the other hospitals also, there were not facilities for treating anything like the number of orthodontic cases that required treatment. With regard to the treatment of patients who could pay a certain fee, that raised a very difficult and awkward question. They might not be able to pay the fees of an orthodontist in Wimpole Street, but they might be able to pay the fees of an orthodontist practising in an area where fees were not so high, and in any event it would mean in some cases taking away work from the private practitioner that should not be taken away from him. For that reason the Eastman Clinic had confined itself to treating people who could not afford to pay for treatment, although it had a wider margin for those requiring orthodontic treatment

than for those requiring ordinary dental treatment. With reference to Mr. Russell Marsh's question about using retaining appliances after deciduous teeth had been extracted, he had often thought he would like to do that, but the Eastman Clinic dealt with patients on such a large scale that, if retaining appliances were put in in all cases in which deciduous teeth had been extracted, there would soon be many thousands of them in use and the whereabouts of half of them would not be known, and many patients who ought to come back to the Clinic to have the appliance taken out would not do so. Therefore he had always felt that that procedure must be omitted altogether, although if it could be done there were many cases in which it would be admirable. The President was right in thinking that he could not deal with her point about the Eastman Clinic becoming a post-graduate school, but it was a matter which would no doubt receive consideration in the future.

The Relationship between Incisor Overlap and the Extraction of Upper Temporary Teeth*

By K. E. Pringle, L.D.S.Eng.

I WOULD like first to give my conclusions so that the points which I wish to make can be followed more clearly. They are as follows :—

(*a*) In cases of normal antero-posterior arch relationship the early extraction of upper temporary molars or canines allows, at first, the crowns of the upper laterals to drift distally and, relative to the lowers, backwards, if the bite allows this.

(*b*) The centrals also tend to follow the same course.

(*c*) There is no tendency for the incisor overlap to increase.

At the demonstration meeting of this Society in May, 1937, I brought forward figures from the examination of 850 original models of orthodontic cases, which showed that incisor close-bite was much more common where there had been loss of lower temporary molar teeth than where there had been no such loss. No account was taken of the loss of upper temporary teeth in these cases. At the suggestion of Mr. G. J. Parfitt I have since tried to estimate whether the extraction of upper temporary teeth had any effect on the incisor overlap.

It seems from these figures that, while there may be a slight tendency for increased incisor overlap where there is loss of upper temporary teeth as well as lowers, on the contrary, where there is loss of upper temporary teeth only, there is no such tendency. On examination of the models of the latter cases one factor was found to be present in 14 out of the 17 cases, which had temporary or permanent laterals in position ; the upper laterals were edge to edge or had only a very small overlap. There are five illustrations of this condition (Figures 2, 3, 4, 5, 6.)

The remaining three cases have also a common factor, a deep

* Read before the Society, November 7th, 1938.

Fig. 1.

The degree of Incisor Overlap at 7 to 8 years of age in cases of Normal Antero-Posterior Arch Relationship.

	(Cases examined)	Number of cases.	More than one-third overlap.	%with more than one-th rd overlap
No loss	(850)	30	10	33%
Loss of one or more lower temporary molars or canines without loss of upper teeth.	(850)	21	14	67%
Loss of one or more upper and lower temporary molars or canines.	(850)	62	48	77%
Loss of one or more upper temporary molars or canines withou : loss of lower teeth.	(2,000)	22	7	32%

incisor overlap, preventing the upward movement of the laterals as is seen in Fig. 7. Other points noted are :—

1. In several cases the upper temporary canines are not only edge to edge but also tending to become instanding.

2. In several cases the upper E's, by rotation, are more lingual than usual.

3. In all the nine cases of unilateral extraction the centre line has swung to the side of the extraction.

Therefore in spite of unknown factors such as the forward movement of the mandible and pressure of upper permanent canines on the lateral roots, I would offer the interpretation already given, that : In cases of normal antero-posterior arch relationship the early extraction of upper temporary molars or canines allows, at first, the crowns of the upper laterals to drift distally and, relative to the lowers, backwards, if the bite allows this. The centrals also tend to follow the same course.

In conclusion I should like to say that the cases were unselected, except for the conditions as to age and arch relationship, the term normal antero-posterior arch relationship being used somewhat colloquially. The reason for the scarcity of cases is that lower extractions are more common than upper, and one very rarely sees extraction of upper temporary teeth without lowers as well.

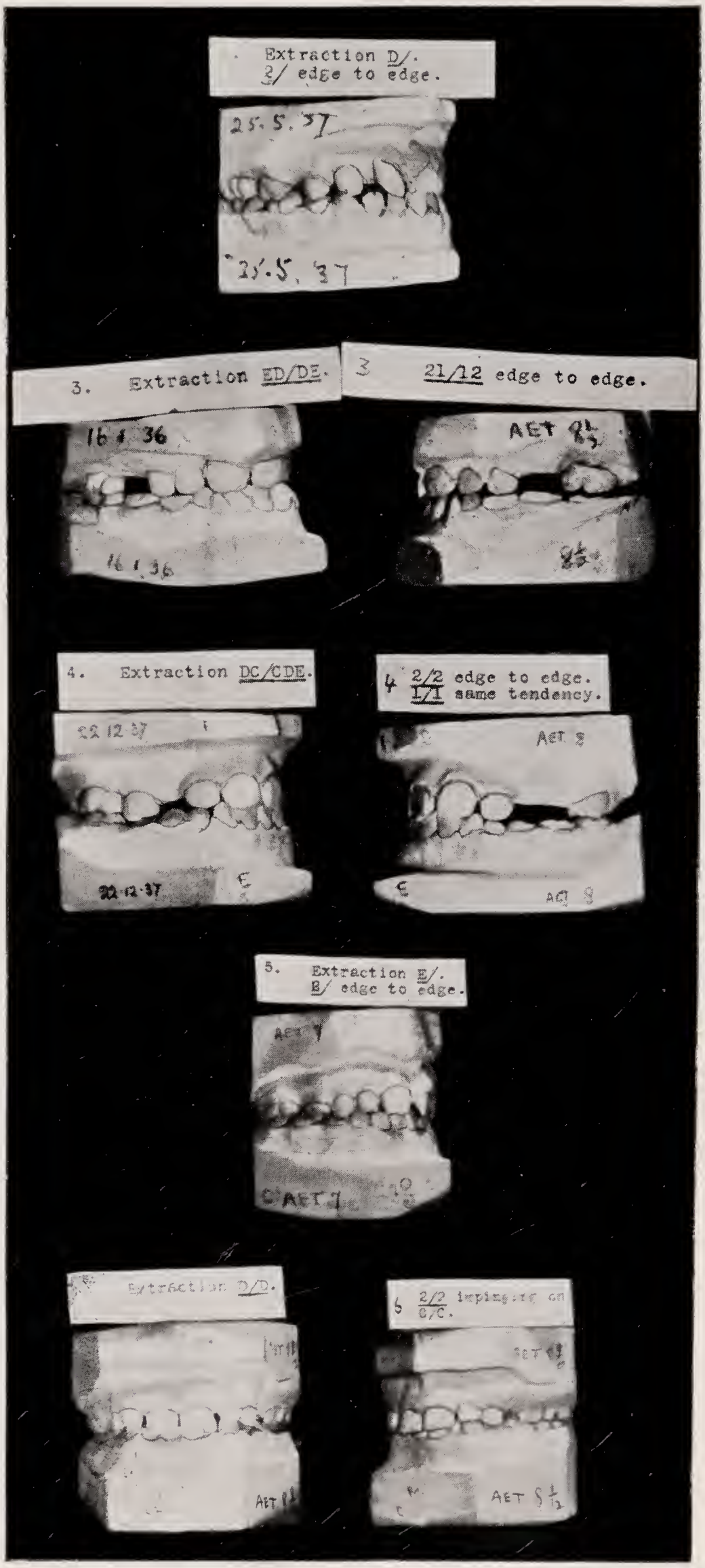

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

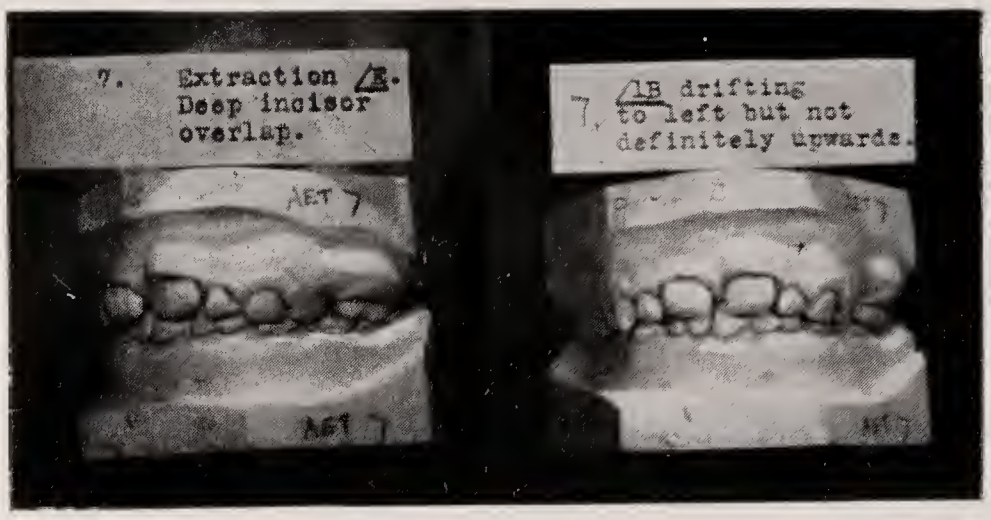

Fig. 7

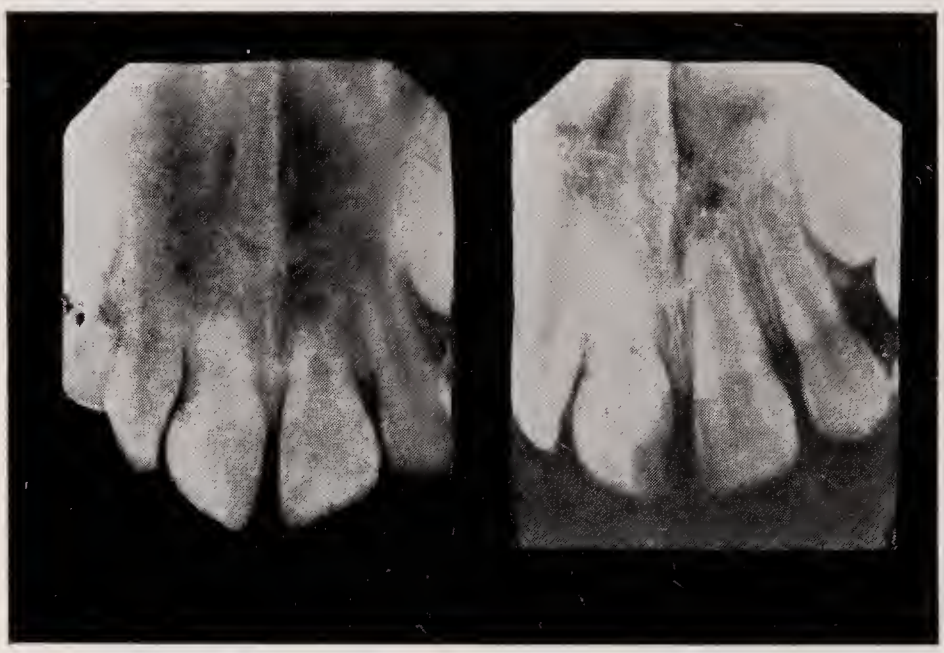

Fig. 8

My last illustrations show X-rays of two cases taken after an interval. Fig. 8 shows a case of incisor open-bite and does not come within the scope of the investigation but reveals clearly the movement of the crowns of the laterals and centrals from the mid-line after extraction of D C | C D. The interval is five months. In Fig. 9, movement of crowns of centrals and laterals from the mid-line is also seen following extraction C | C. The interval is four months. I have had the X-rays taken as nearly as I could in the same position, but I do not know how to take them always in the same position after an interval. I think it would be very useful if we were able to do that, and perhaps someone here could help me in the matter. I am very grateful to Mr. Bocquet Bull and Mr. Rix for their advice and for letting me use the models of their orthodontic cases at Guy's Hospital for this investigation and to the dental council of Guy's Hospital for allowing me the facilities of the dental research laboratory for the preparation of my illustrations.

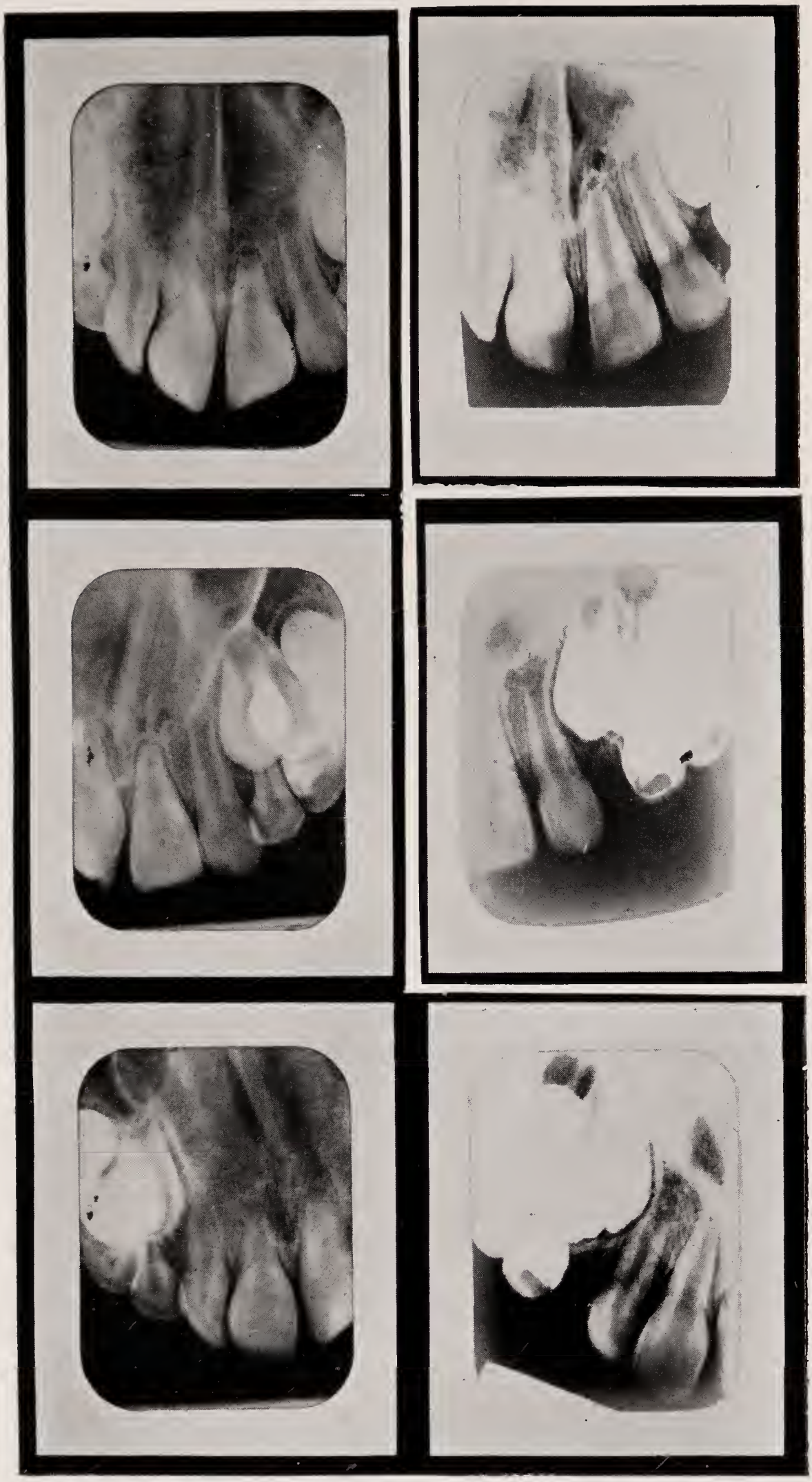

Fig. 9

Discussion.

The PRESIDENT said that Mr. Pringle's Communication opened up a good field for discussion. She suggested that Mr. Pringle should read a paper by Mr. Russell Logan which would appear in the next issue of the *British Dental Journal*, as that would show him how to get the X-rays in the same position. It seemed that Dr. Bauer was correct in his statement, refuting the work of Stein and Weinmann on the movement of the teeth, that they moved towards the gap and not always towards the centre of the mouth.

Mr. R. E. RIX said he would like to thank Mr. Pringle for his very valuable Communication, which raised many interesting points. He thought the fact that upper deciduous molars were extracted less frequently than the lowers, on account of dental decay, should be a very significant one for investigators into the ætiology of dental caries. The upper and lower deciduous molars were not so very dissimilar in shape, yet their different locality in the mouth made their susceptibility to caries different. He would like to ask Mr. Pringle whether he knew of any work which was being done along those lines. Another interesting point brought out by Mr. Pringle tended to destroy the belief that the incisor overlap automatically increased as soon as deciduous molars were extracted. Text-books led one to believe that otherwise uncomplicated cases with excessive incisor overlap were due primarily to lack of vertical growth of alveolus in the cheek region. If that were so, one would still more expect to find the overlap increasing if deciduous molars were lost, yet if upper molars were lost, the overlap did not increase; in fact, it seemed to him that it tended to decrease. He thought that the primary condition governing the degree of incisor overlap was the immediate antero-posterior relationship of the upper and lower incisors. When upper deciduous molars were extracted, the upper incisors were not kept forward in relation to the lower incisors; they were no longer buttressed forward by an intact upper arch. The lower arch continued to be translated forward during the period of normal growth, thereby decreasing the distance antero-posteriorly between upper and lower incisors, and he thought that the overlap thus progressively decreased. In the course of time he would probably be able to produce serial models showing that. He would like to ask Mr. Pringle whether, in spite of a decreased incisor overlap where upper deciduous molars were extracted, he had formed the opinion that the mandible over-closed, as it were.

Mr. H. CHAPMAN said that Mr. Pringle had done a very valuable work, for which the members were greatly indebted to him. Any criticism he offered would be of a constructive character, with the object of making any future investigations carried out by Mr. Pringle even more valuable than the present one. Mr. Pringle had said that he took a third of the crown as his criterion of over-bite, and he would like to ask how Mr. Pringle arrived at the length of the crown. At 7 or 8 years of age the total crown length was not exposed: did one assume what it would be from the amount of tooth exposed at the moment? He understood that none of the cases shown by Mr. Pringle was a case in which serial models had been taken, with the exception of the last one. Was he right in that?

Mr. PRINGLE said that the case before the last one was also a case in which serial models had been taken, but that was not really in the investigation. In none of the other cases had serial models been taken.

Mr. CHAPMAN said it therefore seemed to him extremely difficult to assess whether or not there was any difference in the over-bite as a result of the extraction of the teeth. There was an assumption that it changed, rather than any definite proof, and he agreed with Mr. Rix

that it was quite likely that serial models would show that the over-bite decreased in some cases : he had shown examples of this. He would have liked Mr. Pringle to give some reason for the loss of lower molars having a different effect from that produced by the loss of upper molars. That might be the case, but he did not feel that Mr. Pringle had given any reasons for it which the members could think over and on which they could decide whether they agreed with Mr. Pringle or not. He was extremely interested in the last case shown by Mr. Pringle, which showed that when the deciduous canines were lost the incisors moved distally and increased the incisor spacing, but it was quite likely that, if serial models were taken, it would be found that in some or all cases the space closed again, just as much as it opened. It struck him that the number of cases found in the 850 examined was extremely small. He took it that Mr. Pringle did not mean that there were 67 per cent of cases in the 850 ?

Mr. Pringle said there were twenty-one cases showing loss of upper teeth without loss of lowers.

Mr. G. Northcroft said he could not refrain from drawing attention to one point which seemed to have been overlooked. He did not know whether it was thought that the overlap of the incisors would either increase or decrease when the deciduous molars were removed if the first permanent molars were already in occlusion. The jaws certainly could not come together any more closely if they were propped open by the first molars. Then the problem seemed to be whether the backward movement of the maxillary incisors would increase or decrease the overlap. He could understand that the removal of the deciduous mandibular molars would result in a backward movement of the incisors and therefore an increased overlap, but he could not quite see that there would be a decreased overlap of the maxillary incisors simply owing to the extraction of the deciduous maxillary molars, and he did not know whether Mr. Pringle thought that in all the cases there was a definite decrease in the overlap and a tendency to edge-to-edge bite or that the overlap remained the same.

Miss K. C. Smyth said she would like to thank Mr. Pringle for undertaking the investigation that he had described and to express the hope that he would continue to do such work. There was one question that she would like to ask, with regard to the way in which Mr. Pringle estimated the overlap of upper incisors over lower incisors when there was a considerable antero-posterior space between them. When she had taken such measurements she had found that a difficulty, when there was perhaps as much as half an inch or more antero-posterior distance between the two, and she would like to know the method adopted by Mr. Pringle.

Dr. D. A. Imrie said he had listened with great interest to Mr. Pringle's communication. Whilst he could not say very much about it from the orthodontic point of view, he could answer Mr. Pringle's question as to the difficulty of taking X-ray photographs in the same position after an interval. One could take the precaution of having the occlusal plane exactly horizontal and reproduce exactly the same angle on the beam of the X-rays, but it was also necessary that the film should be in the same relationship to the long axis of the tooth before one could reproduce an exactly similar radiograph, and he thought the only practical method was to get those factors as nearly as possible the same and then work on the system of trial and error, actually measuring the length of the tooth on the radiograph. He did not think there was any rule by which the position could be exactly reproduced ; it had to be done by trial and error.

Mr. K. Pringle, in replying to the discussion, said he did not quite understand what Mr. Rix meant by asking whether the mandible overclosed.

Mr. Rix said he meant : Did the jaws seem to come closer together than was normal ?

Mr. K. Pringle : In the case of lower extractions or upper ?

Mr. Rix : Upper.

Mr. Pringle said that on the whole he would say the children had a flattening of the upper lip, but he would not say they were overclosed. In reply to Mr. Chapman's question as to how he arrived at the length of the crown, there was no standard of measurement that one could use, but he had been as honest as he could in the matter and he had brought the models for Mr. Chapman to examine, if he wished to do so. He had estimated the length of the whole of the crown. With regard to serial models, in his private practice he had not had one case of the kind he had described, although he had been looking for such cases for three years, and the number of cases at Guy's Hospital, where he had been looking for them for two or three years, was extremely small. He believed it would take two or three lifetimes to get serial models in twenty cases, and unless there were twenty cases it would not be worth doing. With regard to Mr. Chapman's reference to the incisors in the last case the temporary canines actually had been extracted for orthodontic reasons and had not been lost naturally. He, Mr. Pringle, had said that the first movement was backwards, but he had not said anything about what might happen afterwards. The incisors might come forward again. It seemed to him that the reason why the bite closed with lower extractions was, as Mr. Northcroft had said, that the lower incisors fell back. He thought that, in referring to the 6's being in occlusion, Mr. Northcroft was thinking of cases a little older than the ones that he had taken. At seven to eight years of age they would certainly be in occlusion, but not fully erupted. It seemed to him that, with extractions in the temporary molar region, the crowns of the incisors tended to swing round, coming distally in one direction and backwards in another direction towards the space. He agreed with Miss Smyth as to the difficulty of measuring the overlap, but in all the cases he had shown there was roughly normal arch relationship, i.e. the incisors were very near to one another ; therefore the question of half an inch did not come in.

Miss Smyth : I was thinking of some future work.

Mr. Pringle said it was very difficult to measure the overlap in such cases. Mr. Imrie's suggestion of having the occlusal plane always horizontal would be very useful, he thought, but it was not easy to do that in hospital cases.

A CASE TREATED BY THE SKULL AND CHIN-CAP METHOD*

By S. A. Riddett, L.D.S.

MR. PITTS in his Presidential Address delivered to this Society in 1931, and entitled, "Some Observations on Malocclusion of the Deciduous Dentition," says: "Any investigation of the irregularities of the deciduous teeth demands a plentiful supply of children ranging from two to six years . . . even in a dental hospital this material is not plentiful, while in private practice it is still more scarce." Later, in speaking of "Inferior Protrusion with Prenormal Occlusion" (Angle's Class III), he goes on to say, "True cases of inferior protrusion in the deciduous dentition are usually thought to be rare. I have, however, collected eight cases . . . This condition . . . is essentially one of those types of malocclusion which tend to become accentuated in the permanent dentition, and . . . cases of edge to edge bite with mesial molar occlusion will almost certainly become well-marked examples of inferior protrusion in later life."

In another of Mr. Pitts' contributions (*Lancet*, Sept., 1935) and on the same subject (Class III), he said, "A restoration to an anatomically normal relationship of the arches is unlikely. In some cases . . . and despite all treatment the condition persists and gets worse. For this reason the prognosis should be cautious."

The case I am showing this evening is the only one of its kind I have met in my own private practice. Also it seems to confirm the truth of the statement regarding the unlikelihood of restoring an anatomically normal arch relationship. At a meeting of the B.S.S.O. some years ago (1930) I heard Mr. Chapman describe a case of prenormal occlusion which he had treated in a very young child by means of intermaxillary elastic force only, acting on an aluminium chin-cap from a head-cap; it took nine months. Treatment in that case was begun, I believe, at the age of one year and five months. Just about the time this case was reported, the little girl who is the subject of my report to-night was brought to see me; Mr. Chapman kindly supplied me with the exact details of his appliances, and the head-cap and chin-cap I used were of the same design.

Report of Case: Female, age 3 years, 3 months at beginning of treatment.

Extracts from my notes:—

Oct. 30th, 1930.—Exam. Impressions. Class III case.

Nov. 14th, 1930.—Gave chin-piece and rubber bands to mother. (The mother made the cap herself, and sewed on the metal "eyes" for attachment of rubber bands).

April 17th, 1931.— $\underline{|}\,2$ inside bite, but otherwise arch relationship correct (a little optimistic! see slides). Has not worn apparatus for two weeks.

Oct. 10th, 1932.—Impressions for record.

*Read before the Society, Dec. 1938.

Dec. 5th, 1934.— $\underline{|\,1}$ tends to come outside $\overline{|\,1}$; advised to use tooth-brush handle to encourage $\underline{|\,1}$ outwards.

Dec. 7th, 1937.—Impressions for record. Gave ivory spatula to encourage $\underline{|\,2}$ over $\overline{|\,2}$.

Nov. 17th, 1938.—At my request, for impressions, photographs and X-rays. Head-cap and chin-piece produced by parent, and photograph taken of the apparatus in situ. Age 11 years 3 months.

Comments.

The illustrations speak for themselves. The improved relationship of the front teeth (as opposed to the arch relationship) seems to have been achieved by a translation backwards of the lower front eight teeth. Antero-posterior measurements taken show that the spaces between the canines and deciduous molars has closed up, and nearly two years after the case was started the distance is slightly less, from the tips of $\overline{c\,|\,c}$ to mesial aspect of $\overline{e\,|\,e}$, than at the beginning of treatment.

The mother was very tactful and wise in her management of the case; we were very doubtful as to how the cap and chin-piece would be tolerated by the child but it was conveyed to her that she would be an important individual. The suggestion worked for five months, during which time she wore the whole assembly day and night, and felt very superior; at the end of five months she changed her attitude to it, and could not be persuaded to wear it again. By that time it had achieved its object; and at the present time, eight years after, the central incisors are still over the lower centrals; it is now proposed to push $\underline{2\,|\,2}$ out; the eruption and behaviour of $\frac{3\,|\,3}{3\,|\,3}$ will be watched with some anxiety.

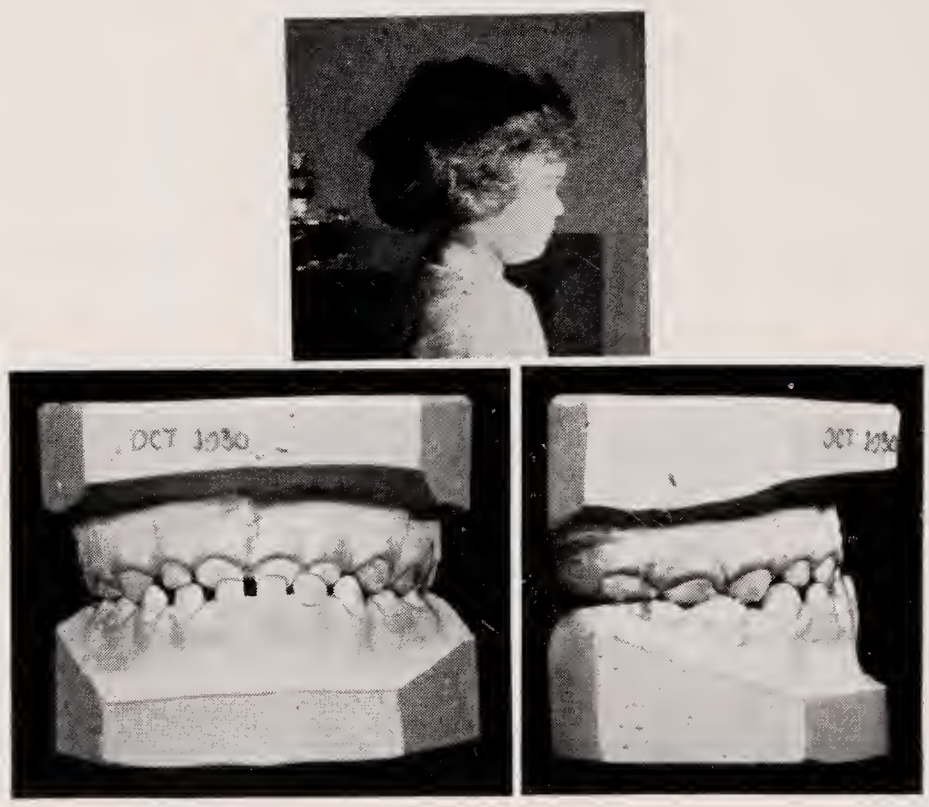

Fig. 1. October 30th, 1930. Spacing of lower incisors. Mother said the child had "formed habit" of thrusting the lower front teeth forward.

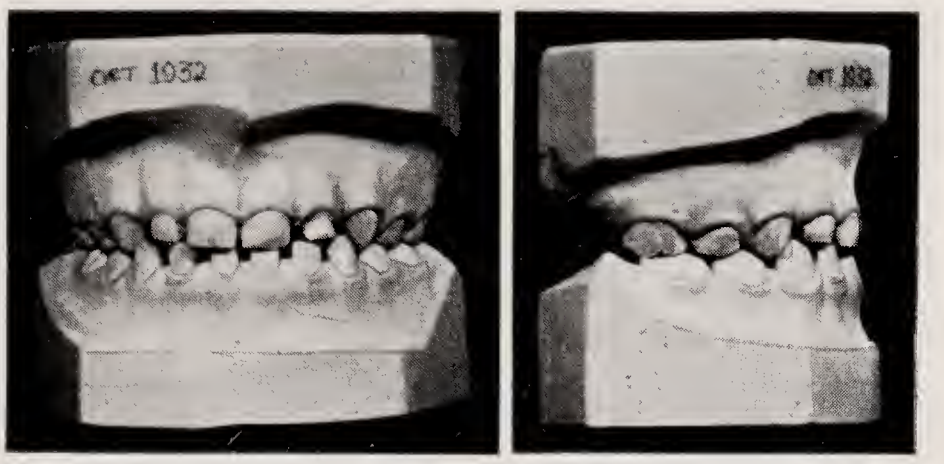

Fig. 2. October 30th, 1930 and October 10th, 1932. Lower fronts have been carried back ; upper " c "s and " d "s also been moved back by pressure on locked " c "s. Relationship of " e "s unaltered.

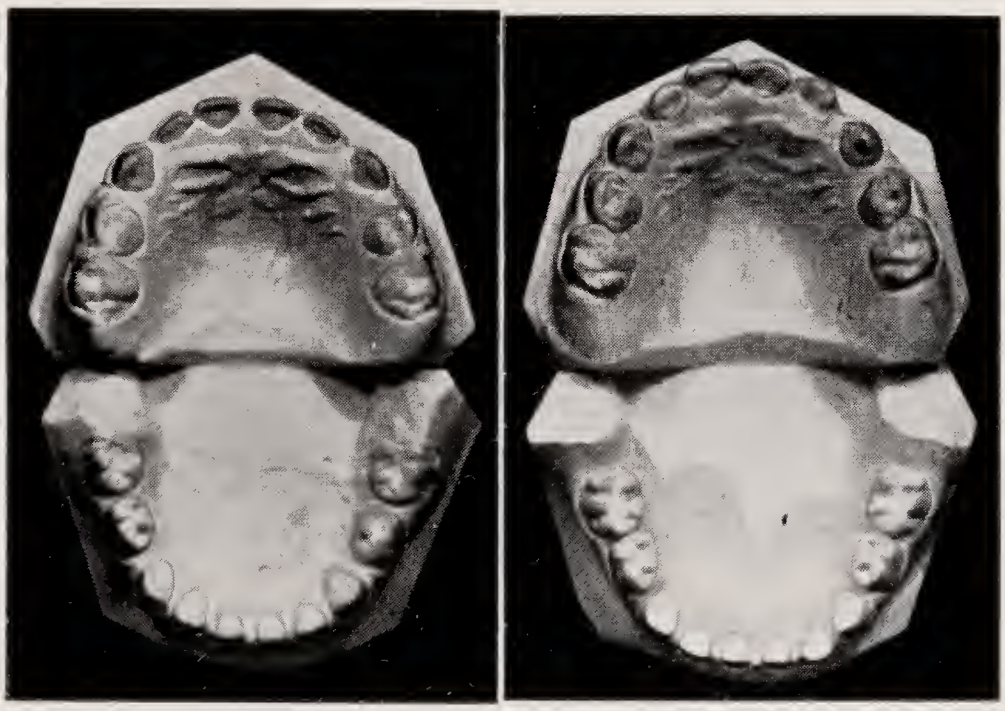

Fig. 3. October 10th, 1932. Occlusal view showing backward travel of lower fronts and upper " c "s and " d "s.

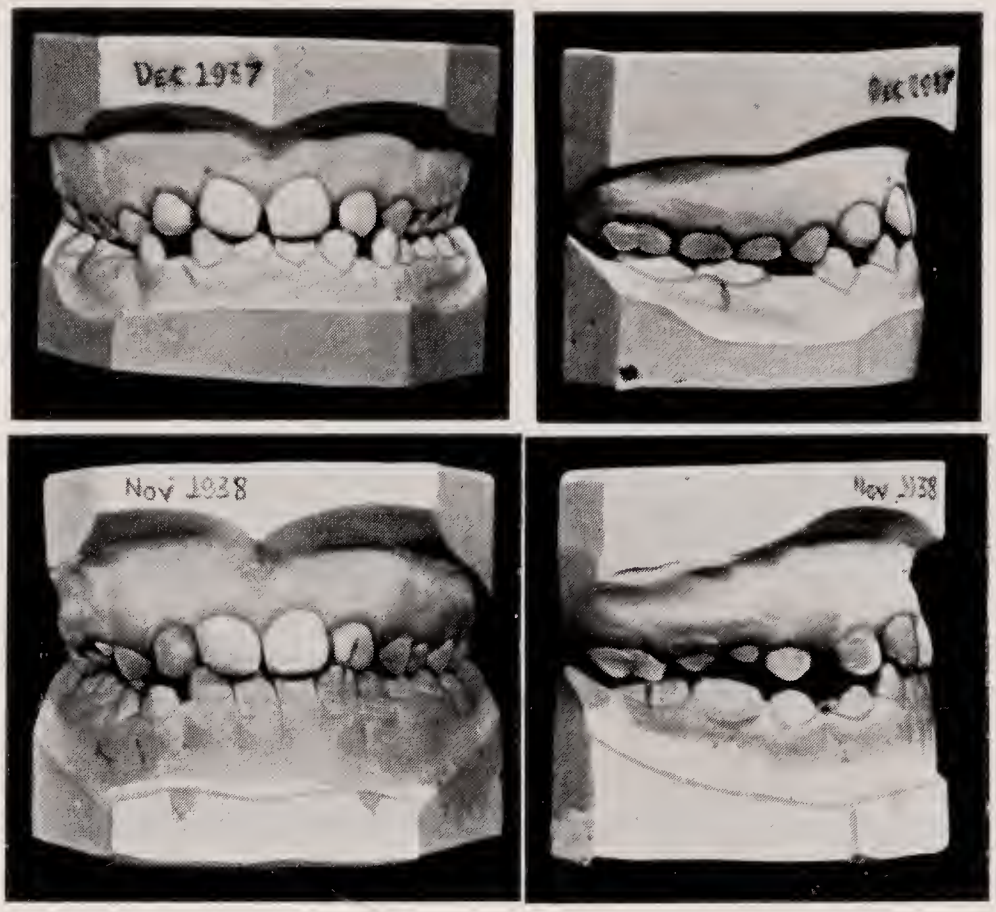

Fig. 4. December 7th, 1937, and November 17th, 1938. A year ago and present day. Shedding deciduous molars and erupting premolars and canines. $\underline{1 \mid 1}$ outside lower incisors. $\underline{2 \mid 2}$ have a tendency to hang back behind $\overline{2 \mid 2}$.

Fig. 5. November 17th, 1938. Apparatus in situ on patient eight years after it was in actual use; to show components. Profile view of child at present day, aged 11 yrs. 3 mths.

Discussion

The PRESIDENT said that this was a case of special interest at the moment. Some of them might have seen in the current *British Dental Journal* an account of a case which looked like prenormal occlusion and Mr. Markham who put forward the communication, had a theory that these cases were not unusual and were often caused by a painful back tooth, or as Dr. Dewey thought, painful tonsils. The child thrust the lower jaw forward at an early age to avoid biting on the painful tooth and so dislocated the mandible. He had actually proved this in a case which came with badly decayed temporary molars, and under gas he reduced the dislocation. Could Mr. Riddett say whether there was anything painful in this case or any nasal or respiratory obstruction which caused the child to throw forward her jaw at an early age ?

Mr. GEORGE NORTHCROFT said that there were two points in this connection which struck him as worthy of special attention. In the photograph taken at a later age one could see how very well the mandible had developed. Probably the case originally arose because there was lack of development of the maxilla as compared with the mandible, and the mandible continued to develop in a marked manner. There was no caries, and the teeth were well formed and normal. Although Mr. Riddett assumed that he had proved that the mandibular incisors went back because of the shortening of the distance between C and E, it was very obvious that the E's in both the mandible and maxilla took their forward positions according to the ordinary law of the development of temporary dentition. The interdental spaces which were present at three years of age were closed by five and the teeth drifted forward in the bone.

Mr. BUCKLEY SHARP said that Mr. Riddett had quoted Mr. Pitts to the effect that these cases in Class III of the temporary dentition tended to become worse during treatment. He (the speaker) quoted a case in which the child was in Class III and the mother also. It was decided that regulation had best be attempted when the permanent upper incisors were erupting so as to guide them over the lowers. The child then became ill and he did not see her for some months. She came presently with the upper centrals in place over the lowers. He again lost touch with her, but he believed she would come again and he would be able to see what had happened to the laterals.

Miss K. C. SMYTH said that the spaces in the lower were obviously closed and the upper molars also had moved forward, but she did not think they moved forward as much as the lowers did. The arch relationship appeared to her not to have altered as between the two sets of models. In both there had been a forward movement. These changes were a question not merely of millimetres but of fractions of millimetres and very difficult to assess.

Mr. E. A. HARDY was particularly interested in this case because he would have put on a skull and chin strap to pull the lower jaw back. The relationship between the maxillary and mandibular arch seemed to have remained the same and the lower front teeth had been pushed back.

Mr. H. G. HOBDELL asked at what age Mr. Riddett would prefer to start treating a case of this type. He felt that it ought to be treated as soon as the abnormality was evidenced. He had only treated one case himself in this manner. The patient was just under two years of age and a good result was obtained with the deciduous dentition. Unfortunately he had since lost touch with the patient.

Mrs. UNGER said that there was often some difficulty in pushing the lower teeth back. The upper incisors seemed to prevent their movement.

Mr. Harold Chapman said that whilst he agreed that there had been a movement of the teeth, he could not help thinking that there had been a backward movement of the mandible in that particular case. It seemed to him that both the canines and the second deciduous molars showed a backward movement. He had had the opportunity of seeing the child referred to some years afterwards, and she had a beautiful set of teeth. He asked whether Mr. Riddett did anything to open the bite in this case. He himself would now open the bite by means of an inclined plane sliding back from the lower incisors.

Mr. Riddett, in reply, said that the teeth were free from caries, and as far as he remembered there was no tender spot at the back of the mouth. He remembered the mother's statement that the child had imitated somebody else and held the jaw forward. Mr. Northcroft had mentioned the lag in the maxillary development. The only thing that struck him with regard to the fallacy of the measurements was that the actual movement back only covered a period of six months. He could not bring forward models to show whether at that time there might have been a closing up by translation of the front teeth backwards. The picture showed very well the great development of the mandible and that this still persisted was quite obvious from the profile portrait. It would be an excellent thing, if apropos Mr. Buckley Sharp's remarks, it were possible to sort out the cases which could be left to nature. Mr. Hardy had interested him ; he spoke of teeth being moved back rather than the jaw itself. The speaker's own feeling was that the jaw was moved back in this case, but he also felt that the edge of the chin cap did have the effect of moving the teeth back rather than moving the jaw, in the first instance at any rate, and that might be the explanation of how the lower teeth jumped the bite.

Mr. Hobdell had asked about the age for treating these cases. The earlier a case could be treated the better, and although he got his case at three years and three months he was hopeful of getting a case under two years. In Mr. Chapman's communication to Bennett's *Science and Practice of Dental Surgery* the apparatus which he used to raise the bite was figured. In his own case he did not have to use a bite plate.

A CLASS 3 CASE TREATED AT A LATE AGE*

By Mrs. M. Possener Michaelis, L.D.S.Eng.

Fig. 1.

Fig. 2.

Fig. 3.

THE patient was fifteen years and nine months old when first seen, but looked older. She was short but strong, healthy and well-developed, particularly as regards the jaws. This will be seen in Figs. 1, 2, and 3. I could not trace any hereditary influence, the mother, father and a sister having excellent occlusion, but I was told that a brother, whom I have not had a chance to see, had a similar occlusion which was treated at about ten years of age with a plate, which, according to reports, he hardly ever wore. This leads me to think that he may perhaps have had two lingually mis-placed upper incisors only. The patient herself wore a plate intermittently at about ten years of age with little success.

The original condition of occlusion is shown in Fig. 1. Normally I should not have treated a patient at this age but she had been

* Read before the Society, Dec., 1938.

very successful on the stage and found herself unable to obtain any film work owing to this handicap. I therefore agreed to treat her and was amazed at the comparative ease with which the mouth responded to treatment. I have brought this case forward for three reasons :—

1. Because I think it is of interest owing to the age of the patient.
2. Because I should like to hear members' opinion as to whether it is or is not a true Class III.
3. Because I am particularly anxious to have members' opinion as to retention.

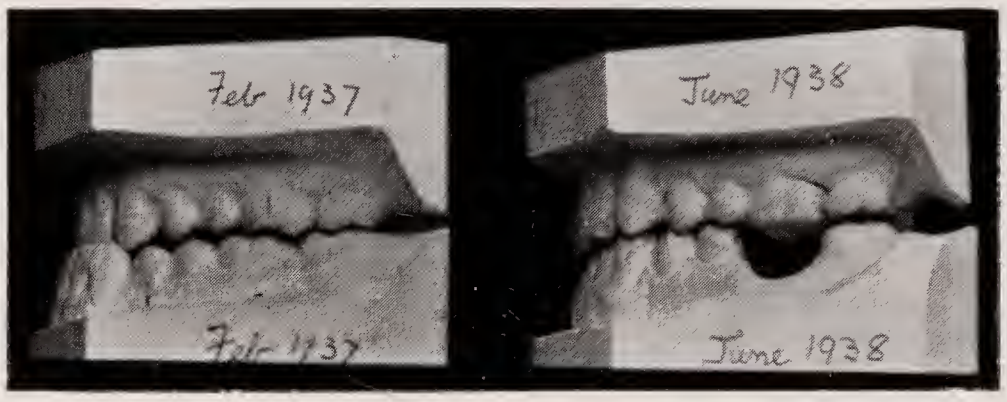

Fig. 4 shows the left side before and after treatment.

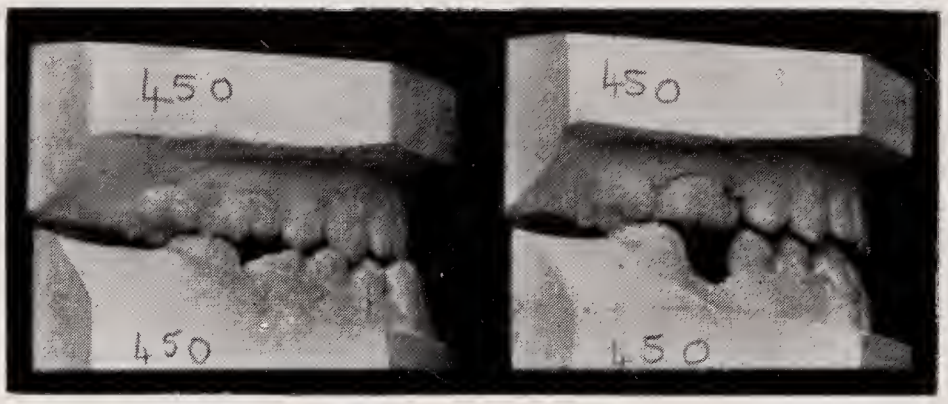

Fig. 5 shows the right side before and after treatment.

Fig. 6 shows a palatal view of the models before and after treatment.

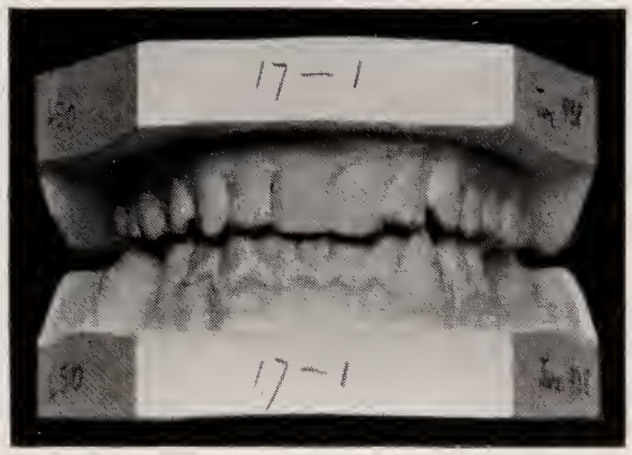

Fig. 7 gives the front view after treatment.

Fig. 8 gives photographs after treatment.

You will see that the $\overline{6}|$ was badly broken down, and although it is not so clearly shown the $|\overline{6}$ was very badly decayed and had an exposure. The right tooth I was unable to save but the left I managed to preserve successfully until the end of treatment when I was obliged to extract it. It is interesting to note that all the wisdom teeth are absent.

Treatment was commenced in February, 1937, and consisted of moving the upper incisors labially and bringing the lower jaw back with intermaxillary traction. This caused the eruption of the $\underline{5}|$ but in spite of constant effort I have been unable to move the upper incisors any further forward or to bring the $\underline{5}|$ into better alignment. I am leaving the premolar however in its present position and not extracting it since it seems to me that it should help in retention. The left upper central proved rather stubborn and when it was edge to edge I fitted it with a small band carrying an inclined plane for a little time.

In October, 1937, the upper incisors were just labial to the lower incisors and I then ground the molars slightly into good occlusion and made the patient do masseter-temporal exercises daily. At this stage I added to the lower buccal bow a spring to press the lower incisors lingually. In July, 1938, I removed all fixed appliances and the patient has since worn removable upper and lower plates with intermaxillary traction at night only, except for a period during September and October when she was ill and left them out. No relapse has occurred however, and I should like to

hear members' opinion as to whether they would have treated the case differently and whether they consider the result is likely to be permanent, particularly in view of the fact that there are no wisdom teeth to erupt. I am wondering whether the spaces in the lower jaw should now be filled in, presumably with inlay bridges, or whether they should be left in the hope that a further backward movement of the lower incisors and premolars may take place.

I have carefully noted the condition of the gums throughout the treatment and at the present time, and have found them to be in good condition, in spite of the lingual tilt of the lower incisors. This I know is not actually correct, but it has helped considerably in the æsthetic result of the case. The only teeth which showed any reaction to treatment were the lower premolars which were apt to become tender when moved distally. You will notice that on the right side there appears to have been a backward movement nearly the whole width of the canine, but that on the left side there appears to be no such movement at all. I think however, that there has been practically no backward movement either of the lower back teeth or the mandible, and that the movement has been confined entirely to the upper and lower incisors. I should be very glad to receive criticisms and suggestions about this case.

Discussion

The PRESIDENT said that it looked to her as if it were not true Class III. The author was to be congratulated on having obtained such a good result.

Mr. R. CUTLER asked whether the patient had any tendency to lisping or speech defect. This was seen sometimes in patients with marked Class III deformity. In a case brought forward by Mr. Watkin the speech defect was cured. He himself had marked in two or three Class III deformities a slight speech defect, all in men, as it happened.

Talking about the importance of the æsthetic side in connection with budding film actresses, one saw these cases very regularly, but he was always left with the impression that a kindhearted manager had chosen this means of telling the budding film star that she was really no use at all. He omitted from this, however, one girl of 16 or 17 years of age he had seen who later became a noteworthy film star. She had a most marked deformity of the lower incisors, but this had not prevented her career ! Bearing on that point, one saw cases of stunted lateral teeth and irregularities of one sort or another for which requests were made for treatment. One practitioner (a lady) in London had evolved a celluloid mask arrangement which these people wore and they could even bite with it. One of these persons so treated and wearing this mask was seen in television, and presented a very good appearance. He believed that he paid a quite moderate fee for this flexible celluloid arrangement. Perhaps other members had some knowledge of these synthetic restorations which if successful would obviously make any prolonged orthodontic treatment the wrong method of approach.

Mrs. UNGER said that it appeared to her that in this case there was a shift from the mid line. Was no treatment contemplated for that ?

Mrs. MICHAELIS replied that as regards the speech, there was no fault at all. In fact, the young woman concerned in this case took a large part in the recent production of " Jane Eyre," and the speech was quite correct. She agreed with Mr. Cutler that managers some-

times siezed upon the excuse of malformations of the teeth to put off would-be actresses who were likely to be unsatisfactory in other respects. But her case was quite genuine and the girl had got her film contract. On the question of the mid line, she did not treat the mid line at all. She thought far too much fuss was made of the mid line. She had seen many cases where the mid line was out but nobody save the dentist would notice it.

A hearty vote of thanks was accorded to the readers of the short communications.

An Ordinary Meeting of the Society was held at Manson House, 26, Portland Place, London, W.1, on Monday, February 7th, 1938, at 8 p.m.

THE PRESIDENT'S VALEDICTORY ADDRESS

Mr. F. St. J. Steadman said that he did not propose to make a Valedictory Address beyond thanking the members for the support they had given him during the past year, and the officers for making his task so light. He desired to say that Miss Smyth was no longer responsible for the programmes of the year, and before she actually took leave of her work in this respect he wanted to express the warm commendation of the Society for the extremely good work she had done in arranging the programmes.

The only duty that remained to him, and a very pleasant one, was to induct into the chair the new President, Mrs. Lilian Lindsay. He invested Mrs. Lindsay with the chain of office amid applause.

Mrs. Lindsay then took the chair and thanked the members for the honour done to her in her election.

Mr. Bull proposed a hearty vote of thanks to the retiring President. He had carried out his duties in the presidential chair in a most satisfactory way, but still more onerous duties had been performed by him in presiding over the Council, and the firm but kindly spirit he had shown in that body was greatly appreciated.

Mr. A. L. Packham seconded the vote of thanks which was carried with applause.

Mr. Steadman thanked the members and said that he had had a very pleasant year of office.

On the motion of Mr. Wilson Charles, seconded by Mr. Pringle, a further vote of thanks was accorded to the officers of the Society.

The following new members were introduced to the President :— Mr. J. F. S. Horton, L.D.S.Eng., Mr. J. E. Inman, L.D.S.Eng., Mr. W. A. Sowden Hills, L.D.S.Eng.

The following candidates for election were duly elected by a show of hands : Miss W. M. Hunt, L.D.S.Eng., 6, Tregaron Avenue, Crouch End, N.8, and Mr. D. U. Warburton, L.D.S., 107, Norton Way, Letchworth, Herts.

Mr. Harold Chapman, who had a short communication to present to the meeting, suggested that, in view of the fact that the Society had never before had a lady President, the Presidential Address should be delivered before he read his communication.

An Ordinary Meeting of the Society was held at Manson House, 26, Portland Place, London, W.1, on Monday, March 7th, 1938, at 7.30 p.m. The President, Mrs. L. Lindsay, occupied the chair.

The Minutes of the previous meeting, held on Monday, February 7th, 1938, were read and were confirmed and signed.

The PRESIDENT welcomed any visitors who were present and invited them to consider themselves members for the evening and to take part in any discussion that might arise.

Mr. D. U. WARBURTON, L.D.S., a new member, was introduced to the President and signed the Obligation Book.

The following candidates for election were duly elected members of the Society by a show of hands : Mr. H. G. Hobdell, L.D.S., Barclays Bank Chambers, 355, Station Road, Harrow-on-the-Hill, and Mr. Martin Radford, L.D.S., Eastman Clinic, Gray's Inn Road, W.C.1.

Dr. SHELDON FRIEL read a short communication, "The Malocclusion of a Famous Horse," and Miss GLASSTONE read a paper on "Tissue Culture Studies in Tooth Development."

AN Ordinary Meeting of the Society was held at Manson House, 26, Portland Place, W.1, on Monday, May 2nd, at 8 p.m. The President occupied the chair.

The following candidate for membership was elected : Mr. R. L. B. Hollick, L.D.S.Eng., 202, Broad Street, Birmingham.

The following demonstrations were given :—

Mr. WILSON CHARLES : "The Growth Movements of the Teeth."

Mr. W. A. SOWDEN HILLS : "The Problem of the Sequelæ of Removal of Deciduous Molars."

Mr. G. F. CALE-MATTHEWS : "A Uniform Orthodontic Model Base-former."

Mr. L. M. MARKHAM : "A Development of the Skeletal Band."

Mr. R. E. RIX : "The Correction of Arch Relationship."

Mr. H. C. VISICK : "The Fitting of Bands and a Modified Cale-Matthews Band-forming Pliers."

Mr. H. G. WATKIN : "Further Developments in Stainless Steel Technique and Some Treated Cases."

AN ordinary meeting of the Society was held at Manson House, 26, Portland Place, London, W.1, on Monday, November 7th, 1938, at 8 p.m. The President, Mrs. L. Lindsay, occupied the chair.

The minutes of the previous meeting, held on May 2nd, 1938, were read and were confirmed and signed.

The PRESIDENT welcomed any visitors who were present and invited them to take part in any discussion that might arise. With regard to the postponement of the meeting, which had been arranged to take place on October 3rd, she was sure all the members would agree that the postponement had been necessary, owing to the trying circumstances at the time. Mr. Pringle had consented to read at the present meeting the short Communication which he was to have read at the meeting on October 3rd, and Mr. Endicott had consented to do the same with his paper. She wished to draw the attention of the members to the fact that the library was now open and that Miss Smyth would be in attendance there on Wednesday evenings, from half-past 7 to 9 o'clock.

With regard to the museum, Miss Clinch had now assumed the office of curator, and it was hoped that the museum would be a success. Any interesting specimens which members would like to present to the museum would be very gratefully received.

All the members would be very sorry to hear that Mr. Visick had been seriously ill. He had had two operations and was now making

good progress, but he was unable to fulfil the duties of president-elect, and, with his usual public spirit, Mr. Riddett had agreed to accept the office of president-elect.

She regretted to announce that a young member of the Society, Mr. Franklin Turner, had passed away in South Africa. He had been a very promising orthodontist and his loss would be felt in all departments of the profession. The secretary had already sent a letter of condolence to Mr. Turner's relatives, and she was sure the members present that evening would like to express their sympathy with them.

The following candidates for membership of the Society were duly elected by a show of hands: Mr. R. S. Pook, L.D.S.Eng., Clydesdale, Hersham Road, Walton-on-Thames; Mr. J. C. Fry, L.D.S., D.D.S., 17, Upper Wimpole Street, and Mr. Klas F. Polsson, L.D.S., Stortorget 25, Malmö, Sweden (corresponding member).

A short Communication was then read by Mr. K. E. Pringle, L.D.S.Eng.

ANNUAL GENERAL MEETING.

The Annual General Meeting of the Society was held at Manson House, 26, Portland Place, on Monday, December 5th, 1938. The President, Mrs. Lilian Lindsay, in the chair.

Election of Officers and Councillors

The President announced that as no new nominations had been made for officers and councillors, those put forward by the Council were duly elected.

OFFICERS AND COUNCILLORS.—

President	Mr. S. A. Riddett.
Immediate Past-President ...	Mrs. L. Lindsay.
Vice-Presidents (in order of seniority) ...	Mr. C. S. Morris. Mr. N. Gray. Mr. M. A. Rushton.
Secretary	Mr. R. Cutler.
Treasurer	Mr. H. R. Evans.
Curator	Miss L. Clinch.
Librarian	Miss K. C. Smyth.
Editor	Mr. R. E. Rix.
Councillors	Mr. H. C. Apperley (London Member). Mr. G. Taylor (Provincial Member). Mr. W. Charles (with charge of programme arrangements).

Election of Auditors.—The President proposed the election of Mr. Bowness and Mr. Newton as auditors, and this was agreed to.

Hon. Treasurer's Report.

The subscriptions during the past year have amounted to £265 10*s.* 10*d.*, the interest received from investments has been £9 8*s.* 1*d.*, making a total income of £274 18*s.* 11*d.*, as compared with £282 10*s.* 6*d.* last year.

The expenditure for the year has amounted to £292 18*s.* 8*d.*, an increase of £109 2*s.* 7*d.* on last year, thus showing a debit balance of the year's working of £17 19*s.* 9*d.* The increase in expenditure is mainly due to expenses incurred in connection with the installation of the Library and Museum at 13, Hill Street. These amounted to £68 12*s.* 11*d.*

During the year 2½% Consolidated Stock to the value of £150 was purchased.

The Society has received a refund of £190 from the Treasurers of the second orthodontic congress owing to the fact that the congress was abandoned.

The Society's assets are as follows : 500 National Savings Certificates at a present value of £620 8*s.* 4*d.* ; 2½% Consolidated Stock, purchase value £400 5*s.* 6*d.* ; Cash at Bank £227 5*s.* 2*d.* ; Cash in Hand £11 16*s.* 2*d.*, making a total of £1,259 15*s.* 2*d.*, as against £1,069 13*s.* 10*d.* last year.

The report was adopted.

Hon. Secretary's Report, 1938.

During the current year certain alterations have been made in our usual arrangements which in retrospect are worthy of your attention.

At the last Annual General Meeting it was resolved to hold a minimum of six meetings in the year, rather than seven as had been the practice heretofore. Bye-law 41 was modified accordingly and the alteration has been effected in the new Book of Rules subsequently printed. This resolution was put into effect during 1938, but the World Crisis in September led to a cancellation of the meeting arranged for October.

Towards the end of the year Mr. Marsh resigned his appointment as curator, and Miss Clinch was immediately elected by the Council under Bye-law 36.

The average attendance at meetings has been approximately fifty, this comparing adequately with 1937 when a decline in attendance relative to previous years had been in evidence. As regards membership, 9 new members have been elected, whilst the loss by death and resignations has been 11, so that the total membership at the end of this year can be regarded as 266 consisting of 149 London members, 98 provincial, 7 honorary, and 11 corresponding members.

The total number is thus virtually less than last year, but it is hoped that members will give every support to the activities arranged for 1939, and by stimulation of interest in our speciality bring about a continued accretion of newcomers to our ranks.

The report was adopted.

Hon. Librarian's Report.

I have pleasure in reporting some new developments during the year. As members are already aware, the Library is now housed at 13, Hill Street, top floor, and available for use of members of this Society at the ordinary hours during which the British Dental Association headquarters are open. In addition, I go to the Library on Wednesday evenings from 7.30 to 9, in case any member wishes to consult me or offer any suggestions as to the uses and functions of the Library. An appointment is desirable if possible.

Your Council has sanctioned the expenditure of various sums of money during this year, firstly for the furnishing of the new room, and lately for the purchase of magazines.

All members have received a copy of the Circular Letter sent out two months ago. I am sorry to say that the response to this was

almost nil, though I am reluctant to believe that this really represents the attitude of the Society. I repeat this evening an appeal to members to come forward with offers of back numbers of orthodontic journals, which surely must be in the possession of some of the senior members. It is a difficult and expensive business to collect the earlier numbers, and assistance is earnestly requested. The *International Journal of Orthodontics* is now completed for the years 1921-1937, but the first six years, 1915-1920, are very hard to complete, and will be expensive—if indeed they can be obtained at all from America. Details of magazines wanted will gladly be supplied to anyone wishing to help.

Translations of a few selected articles from foreign countries will become available during the coming year, and there is a scheme to be put into operation by which any member who desires to have a translation of an article of orthodontic interest in French or German can submit this article to the Librarian, and if the article is approved by the Council, the translation will be arranged by the Librarian, half the cost being paid by the Society and half to be paid by the member sending the paper. A copy will be sent for the member to keep, and another copy will be kept in the Library.

No catalogue is at present available, because the collection of back numbers of journals is going on actively, and any catalogue at present would be of very little value. It is hoped to bring out a catalogue by the end of next year.

It is earnestly hoped that members will take some active interest in the Library and will use it for study purposes. As time goes on it will become more and more valuable, especially when it is remembered that a Museum will be formed within the same room, under the care of Miss Clinch, so that an opportunity quite unique will be available to study records both in the form of literature and in the form of models, etc., at the same time. The room will offer exceptional facilities to the research worker.

The report was adopted.

The PRESIDENT expressed the indebtedness of the Society to Miss Smyth for the work she had put into the re-arrangement of the library.

The following short communications were read : Mr. S. A. Riddett, "A Case Treated by the Skull and Chin-cap Method." Mr. W. Headridge, "The Absence of Teeth and the Effect on the Development of the Jaws." Mrs. M. Possener Michaelis, "A Class 3 Case Treated at a Late Age."

Then followed the President's Valedictory Address and the induction of the President-Elect.

MRS. LINDSAY, in vacating the chair, said she had enjoyed her year of office. She had made many mistakes and members had borne with her most patiently, but the fact that she had not made more mistakes was due to the support she had received from the Council, the Treasurer, and above all, from the Honorary Secretary, whom she thanked most heartily.

The year had not been uneventful. There had been some change in the organisation. For example, the January meeting had been omitted and a longer meeting substituted in March. The same plan would be followed next year. The library and museum had been aroused out of their long sleep, and members had heard from the report of the Honorary Librarian that these departments

were showing signs of lively animation. This fact, together with the report of the Medical Research Council on the measurements of facial growth in post-normal cases, which was a sequel to that on normal cases, had suggested a gift to the library from Mr. G. Campion, who was the instigator of these researches and was president of the Society in 1920 and now one of its most eminent honorary members. For more than a quarter of a century Mr. Campion had devoted much time to the investigation of facial growth and his researches, together with those of Sir Arthur Keith, had been classic. He had collected his reports, his photographs, his measurements, and his history of cases into a most handsome album, and it was intended that he should have sent a letter which could have been read that evening announcing the gift to the Society. Owing to a misapprehension of the date of the meeting on his part the letter had not arrived, but this present would be of the utmost value to the library, a fund for reference and for research.

The Society had passed through a shadow during the last two months in the long and painful illness of the much loved President-Elect, Mr. Visick. It was a great relief to hear that he was now definitely on the road to recovery, and although he had passed out of the Council they hoped that in the near future he would be able to accept the President's chair. But there was always sunshine somewhere in the world, and this time it emanated from one who was always ready to come forward to help—Mr. Riddett, whom she had great pleasure in inducting into the chair.

Mr. S. A. Riddett was then inducted into the chair of the Society, amid applause.

Vote of Thanks to Past President.

Mr. Wilson Charles proposed a vote of thanks to Mrs. Lindsay for her services during the past year. He felt quite inadequate to express the feelings which they all entertained towards Mrs. Lindsay who had given her help so generously and on so many occasions. They had grown to accept these things from her but they were none the less grateful.

Mr. Harold Chapman seconded the vote of thanks, and at the same time took occasion to express their gratitude to Mrs. Lindsay for her work not only in the President's chair but in other spheres in relation to the Society and outside of it.

The President said that there was no need for him to commend that vote of thanks to all those in the room and in the profession. His own debt to Mrs. Lindsay was a very great one, extending back for ten or twelve years.

The vote of thanks was accorded by acclamation, and Mrs. Lindsay briefly replied.

On the motion of Mr. A. L. Packham, seconded by Mr. George Northcroft, a hearty vote of thanks was also accorded to the hon. secretary, the hon. librarian, and other officers, for their work during the past year.

The meeting then terminated.

BRITISH SOCIETY FOR THE STUDY OF ORTHODONTICS

STATEMENT OF ACCOUNTS, 1937–1938

Receipts.

Dr.	1936-1937. £ s. d.	1937-1938. £ s. d.
By Members' Subscriptions	275 11 6	265 10 10
,, Interest on Investments	6 19 0	9 8 1
,, Donation Refunded by Orthodontic Congress	—	190 0 0
		464 18 11
Transferred from Deposit Account ..		10 0 0
	£282 10 6	£474 18 11

Payments.

	1936-1937. £ s. d.	1937-1938. £ s. d.
To Rent	50 0 0	45 0 0
,, Rent at Hill Street	—	18 15 0
,, Printing and *Transactions*	70 13 9	92 11 3
,, Reporting	25 4 0	21 0 0
,, Refreshments	17 7 0	15 9 0
,, Charges in Respect of Lease at Hill Street	—	13 2 0
,, Furniture and Fittings at Hill Street	—	36 15 11
,, Hire of Electric Standards and Tables	3 12 6	3 15 0
,, Petty Cash	10 0 0	20 0 0
,, Refunded Subscriptions	—	1 1 0
,, Bank Debits	0 8 4	—
,, Insurance on Books and Badges ..	0 15 0	0 15 0
,, Slides and other Demonstration Expenses	—	22 14 0
,, Lantern Attendant	2 5 0	2 0 6
,, Luncheon for Mr. Kilner	1 10 6	—
,, Removal of Cabinets..	2 0 0	—
,, Purchase of Consolidated Stock ..	—	150 5 6
	£183 16 1	£443 4 2
Credit Balance	98 14 5	31 14 9
	£282 10 6	£474 18 11

Assets.

			£ s. d.
500 National Savings Certificates—Present Value ..			620 8 4
2½% Consolidated Stock—Purchase Value			400 5 6
Cash at Bank			227 5 2
Cash in Hand: Secretary	£4 19 8		
Treasurer	2 2 1		
Librarian	4 14 5		
			11 16 2
TOTAL			£1,259 15 2

We have examined the Books and Vouchers and certify the above Statement of Accounts to be correct.

P. BUCKLEY SHARP.

A. GORDON TAYLOR.